6-1901

Ornamentals for South Dakota

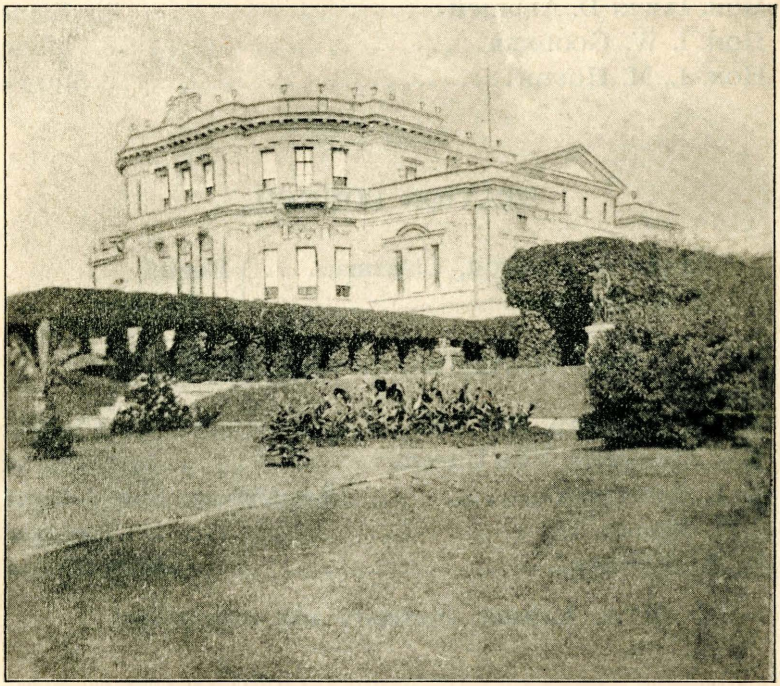
N.E. Hansen
South Dakota Agricultural College

(So. Dak. Bul. No. 72.)

June, 1901. **Bulletin 72.**

U. S. Experiment Station, South Dakota.

In Connection With the South Dakota Agricultural College.



A Native South Dakota Climbing Vine in the Garden of a Russian Prince.

ORNAMENTALS FOR SOUTH DAKOTA.

DEPARTMENT OF HORTICULTURE.

BROOKINGS, SOUTH DAKOTA.

ALLIED PRINTING TRADES UNION LABEL COUNCIL SIOUX FALLS, S. D.

SIOUX FALLS, S. D.
WILL. A. BEACH, PRINTER AND BINDER,
1901.

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ORNAMENTALS FOR SOUTH DAKOTA.

N. E. HANSEN, Horticulturist.

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INTRODUCTION.

The early settlers in a new state are too busy with breaking the raw prairie, grain-raising, and similar work to pay any attention to the planting of ornamental trees and shrubs. As the land becomes subdued, and money more plentiful, there comes a desire to plant trees, shrubs and flowers on the home grounds. The inhabitants of the towns and cities begin this work of lawn-making and planting ornamentals earlier because of the smaller extent of the home grounds. "Ornamentals" is a nursery term meaning trees, shrubs and plants intended for decorative purposes. The first attempts at landscape gardening generally result in expensive failures, because varieties are planted entirely unadapted to our prairie climate. Selection is often made at random from some eastern or southern catalog which contains hundreds of choice varieties, most of which are adapted only to milder and moister regions. The past few years have seen a rapid increase in the work of improving the home grounds of this state and many inquiries are received by this station concerning desirable lists of hardy ornamentals. With a view to giving a definite answer to these questions the writer in the fall of 1896 concluded to increase largely the existing collection on the station grounds by importing several hundred shrubs and trees from a nursery in Germany. This has been increased by additions every year since that time, especially by a collection kindly donated in the spring of 1899, by Prof. C. S. Sargent, director of the Arnold Arboretum of Harvard University, and by a number secured in Russia by the writer in 1897, under authority from Hon. James Wilson, Secretary of Agriculture.

It has been my policy to give no winter protection, with a view to determine the relative hardiness from the standpoint of the prairie farmer. The coldest weather is often experienced here with no snow on the ground. The memorable February of 1899 in which the minimum temperature of 40 degrees below zero Fahrenheit was reached with

the ground bare, was a severe test. The shrubs for the most part were planted in rows eight feet apart and four feet apart in the row; smaller nursery plants were set between the rows at first, the last being removed this year. The location was on high dry land, with a rich, fertile black loam underlaid about two feet deep with hard boulder clay. Excellent wheat crops are raised on similar land in this vicinity. Good cultivation was given during the growing season. During 1899 and 1900, the dates of the periods of blossoming were noted by Mr. W. S. Thornber.

In the following descriptions my authorities on nomenclature have been the Cyclopedia of American Horticulture * by Prof. L. H. Bailey (1900); Handbuch der Laubholzkunde, by Dr. Leopold Dippel (3 volumes, Berlin, 1893); and Deutsche Dendrologie, by Dr. Emil Koehne (1 volume, Stuttgart, 1893). The geographical distribution of foreign plants is mostly from Dippel; that of American plants largely from Bailey. This distribution has been given somewhat fully as an interesting study in plant adaptation. Some deductions may be made with profit from these facts, as a guide to further importations.

At this stage of development of the State no apology is necessary for a report on ornamentals. Purely as a financial venture, money wisely expended upon the decoration of the home grounds will add greatly to the selling value, while there is deep enjoyment and satisfaction, not to be measured by dollars and cents, in beautifying the garden and lawn surrounding the permanent home. Another point to be remembered is that homesickness and dissatisfaction sometimes come to dwellers on open prairies simply from lack of the trees, shrubs and flowers surrounding the old home east. Anything that makes the surroundings of the new home more cheerful, be it rural or urban, adds to the productive capacity, the working ability, of the dwellers in that home. Hence, the advice to plant plenty of trees, shrubs and flowers will be found on close analysis to have a sound financial

*Three out of the four volumes issued at date of this writing.

basis. The Scotchman said: "Be aye planting a tree, Jock; 'twill be growing while you're sleeping." We may add: Plant trees because it pays.

Many have chosen hardy species of trees but have lost them because southern or eastern forms of the species were planted. It is now a well established fact that a species of plant extending over a wide geographical range varies greatly in ability to resist cold. Southern box elders winter-kill in Manitoba; box elders from Virginia winter-kill in Iowa; box elders from Kansas kill to the ground at this station; yet in each case the local native box elder is perfectly hardy. Red cedars from Tennessee winter-kill in Minnesota and Iowa, the northern red cedar is hardy. This law of varying hardiness is now well understood by careful nurserymen. Dakota planters should make sure that their ash, box elder, elm and other trees native to the state are not grown from seed picked too far south. Conversely, it is not best for southern planters to get seed from too far north because the term "hardiness" implies ability to resist heat as well as cold.

In the following list of plants the Latin or botanical name is given first as it is the same all over the world. Much work has been done by the plant-breeders, especially in the horticultural centers of Europe, in hybridizing ornamental trees and shrubs. Insects and the wind have done their share in this work and numerous seed variations and bud variations or "sports" have appeared under cultivation. As a consequence, many of the varieties under cultivation combine the characteristics of two or more species and have in many cases not received sufficient attention from botanists to determine definitely their exact status. These puzzling intermediate forms have been found especially in Philadelphus, Spiræa, Pyrus, Prunus and other of the large genera. Authorities do not always agree as to names and the work of revision is constantly under way, hence the following list is subject to change, especially when the arboriculturists and botanists of Europe and America unite in accepting the law

of priority in scientific nomenclature. At present the rigid enforcement of this law is resulting in much confusion in trade catalogs, some names being discarded which have been in common use in nurseries for a generation past.

WHERE TO PLANT ORNAMENTALS.

Landscape gardening, which is recognized as one of the fine arts, along with music, sculpture and painting, is defined by Downing to be "the Beautiful, expressed in a home scene." The three leading styles are: 1, the Ancient, Formal, or Geometric; 2, the Modern, Beautiful or Irregular; 3, the Picturesque. Broadly speaking, the dominant thought of the three styles may be expressed in a mathematical way as:

1. Art—Nature.
2. Art —|— Nature
3. Nature—Art.

For Dakota conditions the beautiful or modern style is probably the most suitable. It means that the grounds are laid out and planted so that the "charms of nature are judiciously heightened by art." It discourages the use of "barbered trees," clipped into all manner of geometric and grotesque forms, and flower beds of geometric patterns. It encourages planting so that when finished both the artist and the gardener will be satisfied with the picture. The formal style was the only one employed by the ancients and is simply the extension of the architect's art to the surrounding grounds. It has been termed "vegetable sculpture" and implies the free use of statuary, flower-beds of regular geometric forms, straight lines and formal designs, and plants trimmed in regular forms. Its place is mainly for the grounds surrounding palaces or large public buildings, but small home grounds can sometimes with advantage be arranged in this style. The expense precludes its use upon grounds of large size where economy is necessary. The picturesque style is "untamed nature in all its wildness" and is

adapted mainly for mountainous regions and picturesque positions.

The literature of this subject is extensive and the subject can not be discussed further in the space available at this time. A few directions for planting in the modern or beautiful style may, however, be given, so that the planter may avoid some of the most common errors now made in laying out home grounds.

1. The shrubs should be planted in thick, irregular clusters or groups with no sod among the plants in the group. The common method of planting shrubs is to scatter them out singly, "like exclamation points," so that each lonesome little bush gets sod-bound and its days are few and full of trouble. These groups should be mainly in the corners and at the sides and back of the lawn, leaving the main center of the lawn free. Avoid cutting up the center of the lawn with a bed of geraniums or other flowers. These belong more in front of clumps of shrubbery or close to the house.

2. LAW OF CURVES. "Curved is the line of beauty," hence curved lines are the characteristics of this style. Avoid planting trees in straight lines, except, of course, on division lines. Drives and walks should be laid out in graceful curves. These curves must appear to be laid out for the purpose of passing some obstacle, otherwise the eye is not satisfied and there is the constant temptation "to cut across." Hence the skillful landscape gardener plants trees and shrubs in the hollow of the curves; this also increases the apparent extent of the grounds, a fresh view being presented at every turn in the curve. For small grounds, good curved lines may be marked out by throwing a rope fastened to a stake at one end, until the curve satisfies the eye.

3. For the sake of privacy and comfort, a screen or hedge should be planted dividing the front lawn from the back yard. This need not be a straight line, but if preferred may consist of a continuous, irregular border thickly planted with many varieties of shrubs. Next to the shrubs on the lawn

side may be planted hardy perennials, annual flowers and some hardy bulbs.

4. The greatest enemy of the trees and shrubs on the lawn is the grass. The grass roots rob the soil of moisture for several feet from the edge of the sod. The best question to ask a man who plants a choice collection of trees and shrubs, each in a little hole in the sod, is: How will corn do under such method of culture? The wise planter should certainly give valuable trees and shrubs as good care as he would give to corn. The first ten years of a tree's life it must be protected from grass roots robbing it of moisture; after that, it should be able to take care of itself. Clean cultivation is better than any mulch. By this is meant stirring the ground with spading fork and hoe enough to keep the earth mellow throughout the season. Especially must this be done soon after a rain, before the ground begins to bake. A mulch of straw or similar material is good to retain the moisture, especially in July and August; provided it be removed at intervals and the ground stirred. Roots must have air as well as moisture. Continued mulching brings the roots too near the surface. The favorite mulch of the experienced nurserymen and tree-planter is the dust mulch, made by frequent shallow stirring of the soil. This is the cheapest mulch where many plants are under cultivation. The drier the season, the more frequent the cultivation. It is next to irrigation, in fact, better than irrigation that is not followed by cultivation to break the crust. The amateur's method of watering choice plants every day is "killing them with kindness." If watering becomes necessary, remove the mulch or top soil, give a very thorough soaking, then replace the first dry surface soil and then the mulch. One good watering like this is better than a dozen ordinary sprinklings. A depression should be left around each plant to catch the water.

5. Do not plant too many trees close to the house. Damp walls increase doctor bills. Sunlight is an excellent germ-killer. If possible, the sun should shine into every room in

the house sometime during the day. If possible, the road should not be hidden from the house by trees. The house should be a home, not a hermitage.

6. In planting wind-breaks, a "snow-trap" should be provided. This means that two or three thick hedge rows of willows or similar trees are planted four to six rods from the north and west sides of the wind-break. This leaves an open space in which the snow lodges. This open space can be utilized for a garden if desired.

7. Study the characteristics of trees and shrubs so that due allowance may be made in the original plan for the changes in size and habit. Do not plant large trees and shrubs in order to get "an immediate effect." Smaller sizes are cheaper and much more apt to live.

DECIDUOUS TREES AND SHRUBS.

Acer Ginnala, Maxim. Manchurian Maple. Native of Manchuria, North China, Mongolia and Japan. A hardy maple forming a large shrub or small tree now eleven feet high. Full of seed this year. The bright red coloring of leaves in the autumn makes this graceful dwarf maple desirable for the lawn.

Acer Negundo, Linn. (*Negundo aceroides, Mœnch.*). Box Elder, Ash-Leaved Maple. Native of Canada and eastern United States south to Florida, west to the Rocky Mountains. This is native all over the state and is one of the best trees for the prairie planter for shade and wind-break. The dense foliage appears early. It is a good nurse tree for other more valuable trees, such as ash, which leave out so late that grass gets a start. Only northern native seed should be used. Considerable loss has been experienced in this state from planting southern seed. On the Station grounds trees grown from seed from native Kansas box elders killed to the ground the first winter and have killed back every winter since.

Acer Negundo argenteo variegatum, Hort. *Acer Negundo fol. argenteo-variegatium*, Hort. This is a variety of box elder with leaves bordered with white. It is often

seen in public parks in Germany and other parts of Europe. We have imported it twice, in 1896 and 1899, and find it tender, the leaves failing to withstand the hot sun.

Acer saccharum, Marsh. (*A. saccharinum*, Wangh., not Linn. *A. barbatum*, Michx). Sugar or Rock Maple. Native of eastern United States west to Minnesota. It was recently found native in the coulies of the headwaters of the Minnesota river, Roberts county, S. D., by Prof. D. A. Saunders of this station. The general experience with the eastern Hard Maple in this State is unsatisfactory. Minnesota and Dakota seed should be given a trial.

Acer saccharinum, Linn. (*A. dasycarpum*, Ehrh. *A. eriocarpum*, Michx). Soft Maple, Silver Maple. Native of eastern North America, west to eastern Dakota and Nebraska. The wide range of this popular tree gives rise to trouble from southern and eastern seed. One lot kills back on the station grounds. It is a native of the Sioux Valley in this State and seed from native northwestern trees should be preferred.

Acer Tataricum, Linn. Native of southeastern Europe, through Hungary, through Asia Minor and the Caucasus. A handsome large shrub or small tree. Specimens are six feet in height with handsome foliage. It has killed back only once, in the winter of 1898–'99.

Ailanthus glandulosa, Desf. Tree of Heaven. This Chinese tree has been tested at Vermillion, but kills to the ground.

Alnus glutinosa, Gaertn. Black Alder, Common Alder. Native of temperate and northern Europe and Asia to Japan, also north Africa. A neat ornamental tree but the branches kill back every winter. Our specimens came from Germany.

Amelanchier alnifolia, Nutt. Suscutan or Juneberry. We have secured this shrub from various parts of the Dakotas and Manitoba for use in plant-breeding. The neat handsome foliage and abundant white blossoms in early May followed by the purple berries make it a desirable lawn

shrub. The fruit is prized for table and culinary use. The birds are very fond of the fruit and will take all the berries as fast as they ripen, if only a few plants are set, but in a large plantation the birds' share will probably not be missed. I find that scions from selected bushes can be readily grafted on apple roots.

Amelanchier ovalis, Borkh. This is the the same as *A. rotundifolia*, Roem., native from New Brunswick to Minnesota. A hardy bush five feet in height, with white blossoms in early May. The small blue black berries are taken by the birds.

Ampelopsis quinquefolia, Michx. Virginia Creeper. Native of the United States east of the Rocky Mountains. This is probably our best ornamental climbing vine for covering porches and arbors. As transplanted from the woods of South Dakota this is found hardy throughout the State. Caution should be exercised in buying vines from the nurseries to prevent getting southern or eastern forms of this species. Four forms of this species imported from Germany and planted in the spring of 1896, viz: hirsuta, latifolia, serrata and Engelmanni, are evidently tender forms of this species, as they kill back some every winter, while plants from the woods in this vicinity prove perfectly hardy. In Germany and other parts of Europe it is very largely planted. The plates are from photographs taken by the writer in the garden of a Russian prince* in August, 1894, and will indicate its decorative possibilities in the hands of skillful planters. Several other varieties are described in Bailey's Cyclopædia, two of which cling firmly to walls. The species is evidently quite variable and South Dakota woods should be explored for desirable varieties of this, our native substitute for the ivy. In the west, the Virginia Creeper is sometimes, though erroneously, called Woodbine. Virginia Creeper has five leaflets while the poison ivy has three.

*The gardens of Prince A. W. Barjatinsky, 15 versts from Kolontajewska, in Southern Russia, between Kursk and Kiev. Leading out from two rear doors of the palace was a lofty semi-circular archway with many pillars. The roof of the long archway and the pillars were covered with a dense mass of this beautiful vine.

Poison ivy should be destroyed as a vile weed whenever possible.

Artemesia Abrotanum, Linn. Native of southern Europe and the Orient. This is the common Old Man or Southernwood, and forms a very dense mass of finely cut foliage three to four feet in height. This bush is grown for its aromatic scented leaves; the branches kill back every winter, but sprout vigorously in the spring.

Russian Artemesia. This is a strong growing bush from six to eight feet in height. It has been found very useful at the experiment station at Indian Head, Northwest Territory, Canada, for low snow hedges around gardens to check the surface windsweep and to hold the snow, but is now losing in favor as the native box elder properly trimmed makes a better and more permanent hedge. The branches kill back every winter below the long loose panicles of dull yellowish green very homely flowers. The flower heads should be removed as soon as they appear and the hedge trimmed to uniform height. This will keep the hedge green later in the fall and make it more dense. Cutting the hedge to the ground about every third spring also serves to thicken it. On land too dry for more valuable plants this may serve a useful purpose as a cheap temporary screen, but most people will find the necessary trimming too troublesome and will prefer more permanent and valuable hedges. The plant is easily grown from cuttings and has shown no tendency to scatter seed at Brookings. It was tested by the United States Division of Forestry at this station as a nurse for evergreens and deciduous trees, but was discarded for this purpose as it took all the soil moisture.

Artemesia procera, Willd. Native of Southern Europe through Russia to the Caucasus and Siberia. A bush similar to the common Southernwood but of somewhat stronger growth; height four and one-half feet; habit very dense.

Azalea. The cultivated Azaleas winter-kill in the northwest and are not in the catalogues of northwestern nurseries.

Berberis Amurensis, Rupr. (*Berberis vulgaris, var.*

Amurensis, Rgl.). Amur Barberry. Native of the Amur district, Siberia, and Manchuria. A strong growing, hardy, thorny shrub now five feet high, with yellow flowers and abundant red berries. The leaves assume a brilliant red coloring in the fall.

Berberis heteropoda, Schrenk. Native of Turkestan and Sungaria. A hardy bush with pale bluish green leaves. Not yet fruited. In 1897 the writer found the dried berries sold in the markets at Samarcand, Turkestan.

Berberis laxiflora, Schrad. Dippel refers this to *B. normalis, Hook & Th.* Native of Europe and Asia. A hardy, thorny, strong growing bush, with yellow flowers aud red berries.

Berberis macrophylla, Hort. Native of the Himalayas, Afghanistan and Nepal. Referred to *B. Asiatica* by Dippel. A hardy, ornamental, spiny shrub.

Berberis Siberica, Pall. Native of Siberia, Dahuria and Sungaria. A hardy, handsome, thorny bush three feet in height, of dense habit. The yellow flowers during May are followed by red berries.

Berberis Thunbergii, DC. Native of Japan. Of four plants from the Arnold Arboretum, three winter-killed, one is alive, one foot in height and now doing well. We have tested a large number of plants of this Japanese barberry as imported by Prof. Budd and our own importation from Germany. Many of the plants winter-kill when young when given no protection, but the survivors do better with age. Its low, very dense habit, attractive red fruit and scarlet fall coloring of leaves, make it worthy of trial for dwarf hedges and borders for walks and drives in the southern part of the State, but it cannot be recommended as perfectly hardy.

Berberis vulgaris, Linn. Common Barberry. Native of Europe and Eastern Asia. A hardy bush with golden yellow flowers in May and June, light green leaves, and thorny branches. The acid, bright red berries are useful for making jelly. In a wheat-growing state it is best to avoid planting

Barberries to any extent as it is the host of one stage of a fungus that causes wheat rust. However, the rust is abundant where no Barberries are cultivated, as it can omit this æcidium stage.

The following quotation represents the latest investigations of the subject and indicates that the poor Barberries have been blamed more than the facts really warranted:

"The removal of the Barberry bushes is said to reduce the rust, although many good botanists believe that the Barberry is not necessary for the existence of this fungus, and that, instead of it being necessary to have an intermediary stage of growth of the wheat rust upon the Barberry, the wheat plants may be infected directly; and some of the best authorities also agree that it is quite possible that the wheat rust occurs at one stage upon some wild grass, instead of on the Barberry." From "Diseases and Plants," Tubeuf & Smith.

Berberis vulgaris purpurea, Rgl. Purple-leaved Barberry. A hardy form of the Common Barberry with purple leaves. Very ornamental.

Betula alba, Linn. European White Birch. Native of Central and Northern Europe to Western and Northern Asia. A tree of graceful habit with silvery white bark and slender branches. In the timber plantations on the Station grounds this tree has made a rapid growth and has proven very hardy. Specimens standing in open exposure in sod on the College campus have sometimes suffered after a severe winter following a dry summer, but the tree is sufficiently hardy for ornamental purposes and should be planted, especially when the more expensive Cut-leaved Weeping Birch can not be afforded.

Betula alba pendula laciniata, Hort. Cut-leaved Weeping Birch. There are many beautiful specimens of this species on the College campus and private lawns at Brookings and in other parts of the State. It is probably the queen of lawn trees for South Dakota. It is a tall, slender tree with erect central trunk and long, graceful drooping branches,

which with the white bark and delicately cut leaves, make it a beautiful tree. The pruning knife should be used with great caution—if at all. The many slender weeping branches from the main stem add to the beauty of the tree and should not be removed unless very near the ground.

Betula alba purpurea, Hort. Purple-leaved White Birch. Dippel refers this to *B. alba atropurpurea*, and gives Blood Birch as the common German name. A tree now nine feet in height with the younger branches purplish brown to black. The young leaves are dark purple fading to dark green. A handsome tree of unique appearance. It appears sufficiently hardy for ornamental purposes, having killed back a little but once since planted in the spring of 1897.

Betula lutea, Michx. Yellow Birch. Native from Newfoundland, south to North Carolina and Tennessee, west to Minnesota. As received from Wisconsin this proved very susceptible to sunscald and quite tender, especially in open exposure. Not recommended.

Betula nigra, Linn. Red or River Birch. Native from Canada southward to Virginia, Carolina and Florida, westward to Minnesota, Kansas and Texas. Young plants received from the Arnold Arboretum in spring of 1899, kill back at the tips every winter and are now low bushes two and one-half feet in height.

Caragana arborescens, Lam. Siberian Pea Tree. Native of Siberia and Manchuria. A valuable hardy shrub for ornamental hedges and the lawn. A large, somewhat thorny bush or small tree, attaining a height in its native home of fifteen to twenty feet. Throughout European Russia it is a favorite ornamental hedge plant for the home grounds. In government forestry plantations on the Russian steppes it is used as a nurse tree, or rather, bush, because it endures severe drought. The maximum height of the untrimmed Caragana hedges I observed in Russia was fifteen to twenty feet, but the usual height of trimmed hedges was about one-third of this. The German name "tree-like pea bush" defines the size better than the English name "pea

tree." The name refers to the blossoms which are like those of the pea; the color, however, is yellow. It is a member of the same family, Leguminosæ. In May the bush is covered with a profusion of blossoms. The locust-like foliage appears early and is of a lively green color. This handsome shrub has proven hardy in Minnesota, the Dakotas, Manitoba and Assinaboia. During 1899 and 1900 a large number of plants of this species were sent out by this Station for trial throughout the State, especially the northern half. The seed was imported by the United States Department of Agriculture and secured by the writer in Russia in 1897. None of these plants remain except one sample hedge, and the further work of propagation must be done by nurserymen. Many plants of this species are found among the Russian Germans in the Dakotas grown from seed brought from Russia. The only insect enemy observed so far is the gray or black blister beetle, but so far as we have noticed the ravages are confined to the new leaves and these usually send out a new crop of leaves as soon as the insects disappear.

Caragana arborescens cucullata, Hort. A low dwarf bush of compact habit with leaves somewhat curled; of no special value except as an oddity.

Caragana arborescens, fol. variegatis, Hort. A hardy bush of dense strong growth. In bloom the last half of May. No variegation observable, at least when the leaves are fully expanded.

Caragana arborescens lutescens, Hort. Present height seven feet, of hardy, strong upright growth. The yellowish cast of the foliage early in the spring gives the bush a very distinct expression; this color changes to green later in the season.

Caragana arborescens nana, Hort. A very curious dwarf bush twenty to thirty inches in height, of very dense compact habit. A curiosity only.

Caragana Chamlagu, Lam. Chinese pea bush. Native of north China. A bush now two and one-half feet in height; branches killed back about one-half. Flowers red-

dish yellow, appearing the first half of June. Our specimens are grafted on *C. arborescens* roots and a large lump has formed beneath the surface at point of union.

Caragana cuneifolia, Dipp. Probably from Mongolia and Dahuria. Height now nine feet, of clean upright habit and strong growth. A fine bloomer the last half of May. Perfectly hardy. Apparently a form of *C. arborescens.*

Caragana frutescens, DC. Native of central and southern Russia, Siberia, the Caucasus, and China. This is a dwarf Caragana with large, very dark green leaves. The yellow blossoms appear the latter part of May; not a profuse bloomer, but the blossoms are large. A very hardy bush that we are now testing for dwarf hedges for the lawn.

Caragana frutescens acutifolia, Hort. A bush now two and one-half feet in height with dark green leaves and a few dead shoots. Our two specimens are grafted on *C. arborescens* stock and a large lump has formed at the point of union below the surface, showing the lack of affinity between the two species.

Caragana frutescens grandiflora, Hort. A hardy bush now four feet in height with dark green foliage. Flowers large but not abundant, appearing the latter half of May.

Caragana frutescens latifolia, Hort. A broad leaved variety. Our two specimens are three feet high and grafted on *C. arborescens* stock. The union appears uncongenial, one specimen being dead and the other showing dead shoots.

Caragana frutescens obtusifolia, Hort. Present height four feet. Blossoms not abundant, but large and choice. A hardy bush with dark green leaves.

Caragana microphylla, Lam. Small-leaved Pea Tree. Native of Siberia, Dahuria and Mongolia. A very hardy bush five feet in height, with small leaves of erect habit. A very profuse bloomer in late May and the first three weeks of June. The yellow blossoms are large and showy. Our specimens are budded on *C. arborescens* stock; this method

of propagation would make the plants expensive, but the bushes seed so abundantly that propagation by seed should be an easy matter. One of the choicest Caraganas for the lawn and worthy of general cultivation.

Caragana pygmæa aurantiaca erecta, Dck. Sand Pea Bush. This is referred to *C. arenaria* by Dippel and to *C. aurantiaca* by Koehne. Probably a native of west central Asia, especially the Thian-schan mountains. A low open bush now three feet in height with gray green sparse foliage. The very abundant reddish yellow blossoms appear in late May and early June. Hardy and very distinct.

Caragana pygmæa, DC. Dwarf Pea Tree. Native of the Caucasus, Siberia, Thibet and Tartary. A low open spreading bush with gray green sparse foliage. Blossoms reddish yellow, abundant the last half of May and first half of June. Closely allied to *C. arenaria*, Dippel.

Caragana Redowskii, DC. Native of Siberia. Imported by Prof. J. L. Budd from Russia. A bush now four feet in height, with abundant yellow blossoms during May. Hardy and desirable.

Caragana spinosa, DC. Spiny Pea Bush. Native of Siberia. A hardy very spiny bush three feet in height. The very abundant yellow blossoms appear in late May and early June. Our two specimens are grafted on *C. arborescens* stock. This year a few sprouts from the stock were attacked by the gray blister beetle while the *spinosa* top was scarcely touched.

Catalpa speciosa, Warder. Hardy Catalpa. Native of southern Illinois and Indiana to Louisiana and Mississippi. This beautiful tree has been tried in many places in the state but the general experience is unfavorable. E. D. Cowles reports its degree of hardiness at Vermillion as only six on a scale of ten.

Celastrus orbiculata, Thunbg. Native of China and Japan. A climbing vine with large glossy leaves. Kills to the ground every winter but sprouts strongly from the root.

Celastrus punctata, Thunbg. Now referred to *C.*

orbiculatus punctata, Rehder, in Bailey's Cyclopedia. Of the same degree of hardiness as *C. orbiculatus*, and much like it in other respects.

Celastrus scandens, Linn. Waxwork, False Bittersweet. Native of Canada to South Dakota and New Mexico. This is found in the woods near Brookings and in other parts of the state, and is a choice climbing vine, with glossy leaves. The orange yellow fruit with crimson seeds hangs on all winter and is prized for holiday decorations. The flowers are small and greenish yellow, polygamous, i. e., partly perfect and partly of one sex on the same individual, so that every plant produces some fruit. However, some trouble has been reported from single vines not fruiting satisfactorily, and it appears that the best results are obtained by planting several vines together.

Celtis occidentalis, Linn. Hackberry. Sugar Berry. Western Nettle Tree. Native from Ontario west to Manitoba and Dakota, south to Georgia and Texas. This is a handsome tree for the lawn and does well even on high, dry land. It is a common native tree along lakes and streams throughout South Dakota. It does well in open exposure at Brookings. This tree has been neglected too long by nurserymen and planters, possibly because of scarcity of seeds, the birds being fond of the small, sweet, dark purple berries which hang on the tree into winter. The tree resembles the white elm, but differ in the thin, taper-pointed leaves divided unequally by the midrib. A beautiful hardy lawn tree of rapid growth.

Cladrastis Amurensis, Koch. Dippel gives preference to the name *Maackia Amurensis*. Native of the Amur provinces, Japan and Manchuria. This tree is now only eighteen inches in height, killing to the ground every winter. Too tender.

Clematis. We have made no test of the many choice varieties of this climbing vine; caution is advised. The native *C. Virginiana* has done very well at Brookings. *Clematis Jackmani*, with large purple flowers, has been

grown in the southern part of the state with winter protection and is considered one of the choicest varieties. *Clematis Flammula*, Linn., is reported hardy at Yankton and Mitchell.

Cornus asperifolia, Michx. Rough-leaved Dogwood. Native in the eastern part of United States from Lake Erie south to Florida and Louisiana, west to Minnesota and Texas. As received from Arnold Arboretum, three specimens killed back severely and are not hardy. This species is native along the Missouri river in the southern edge of the state.

Cornus Sibirica, Lodd. This is referred by Rehder to *Cornus alba*, Linn, var. *Sibirica*, Lodd. Native of Siberia. A hardy bush five feet in height. Remarkable for the handsome coral red color of the branches in the winter. A very desirable shrub for winter color effect on the lawn.

Corylus Americana, Walt. Hazelnut. Native from Canada to Florida, west to Dakota. As received from Manitoba and North Dakota this proves hardy. The plants have not yet fruited. In South Dakota it is a native of the Sioux valley, Big Stone basin and the Black Hills.

Corylus Avellana, Linn. European Hazel. Filbert. Native of central and southern Europe, north Africa and west Asia. Several varieties from Germany were planted but all winter-killed.

Cotoneaster acutifolia, Lindl. First found by Turczaninow in the vicinity of Lake Baikal; probably distributed in other sections of eastern Asia. A very pretty shrub with dense foliage of neat erect habit. The leaves are glossy, ovate, pointed. The pink flowers in May are followed by a very heavy crop of brownish black berries. Perfectly hardy. This bush is worthy of general cultivation. Our specimens are now three feet in height. Dippel states the ultimate height is about five feet.

Cratægus cordata, Ait. Washington Thorn. Native of the United States from Virginia south to Georgia, west to Montana and Missouri. Of four plants from Arnold Arbo-

retum, two winterkilled, and two killed to the ground but are sprouting from the roots.

Cratægus sanguinea, Pall. Dippel calls this "Blood Thorn." Native of Siberia, northern China, Mongolia and Manchuria. A hardy small tree now seven feet high with reddish glossy twigs and white flowers, followed by red berries three-eighths of an inch in diameter.

Cratægus sanguinea Schrœderi, Rgl. Hardy; specimen four and one-half feet high. This summer the leaves are badly browned.

Cydonia Japonica, Pers. Japan Quince. Dippel prefers the name *Chaenomeles Japonica, Lindl.* Native of Japan and China. Out of two specimens from Arnold Arboretum one is dead and one survives, but kills to the ground every winter. Better results are reported from the southern edge of the state. Reported half-hardy at Mitchell.

Cydonia vulgaris, Pers. Quince. Probably a native of eastern and central Asia. Quince stocks from Germany winter killed the first winter.

Elæagnus angustifolia, Linn. Oleaster, Narrow-leaved Oleaster, Russian Olive or Russian Oleaster. Native of the countries bordering the Mediterranean Sea, across the Caucusas and northern Persia to southern Siberia and northern China. The wide geographical range of this tree has given rise to some confusion. The form from southern Europe known as *E. hortensis*, Bieb., has not proven hardy in the Northwest. It was not until the Russian Mennonites brought to Nebraska, Kansas, the Dakotas and Minnesota a hardy form of the species from Russia, that the tree attracted attention. It was probably first introduced into South Dakota by the German immigrants from Russia and they have many trees and hedges of it, especially in the southern part of the state. This form is generally known as the Russian Wild Olive, although Russian Oleaster would be a more exact name. It is allied to the Buffalo berry and does not belong to the olive family. The silvery leaves give it an olive-like aspect. Forms a small tree some thirty or more feet in

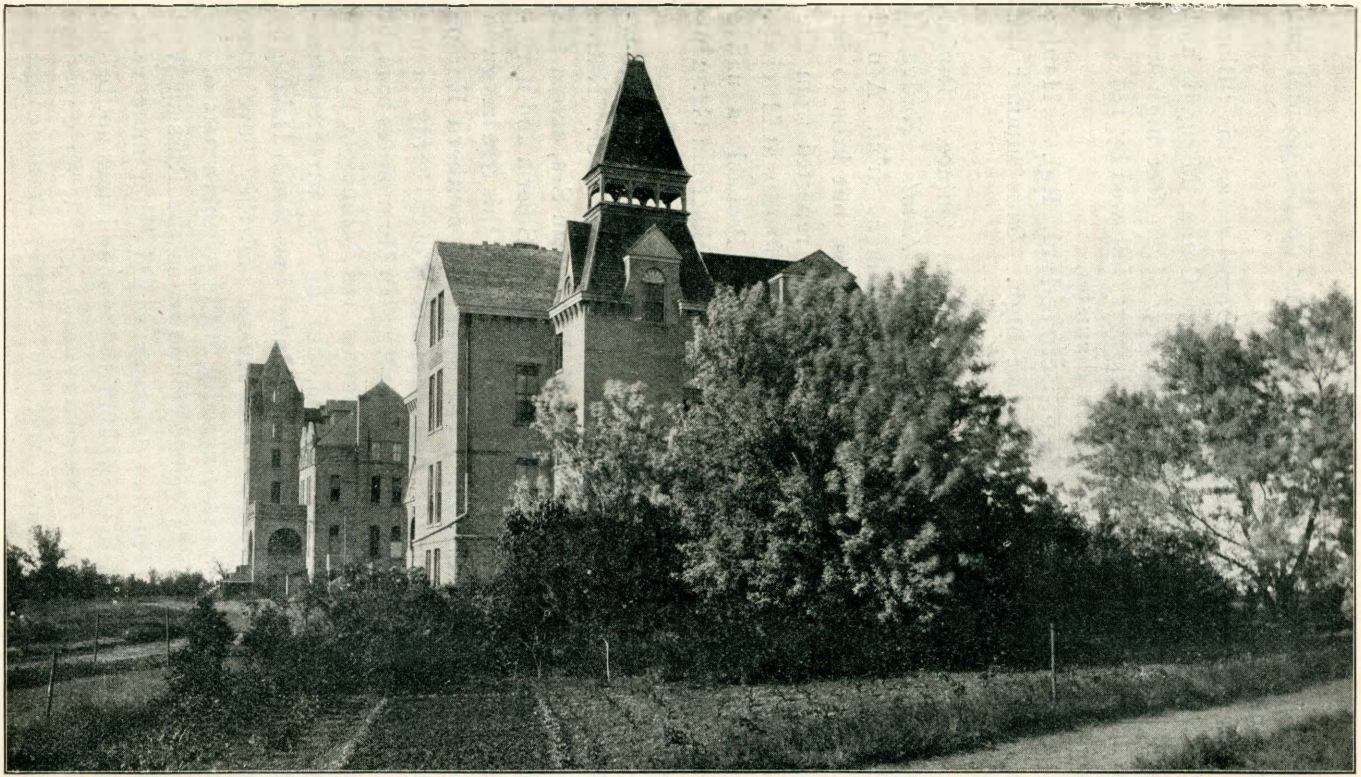

PLATE I—THREE TREES OF RUSSIAN OLEASTER ON THE CAMPUS OF SOUTH DAKOTA AGRICULTURAL COLLEGE.

PLATE II—A SPRAY OF RUSSIAN OLEASTER IN BLOOM.

height with rounded top and entire narrow leaves about three inches long, silvery white beneath, light green above. The small yellow blossoms appear the latter part of June and are remarkable for their spicy fragrance, making the tree a center of attraction while in bloom. The tree is valuable for stock-proof hedges on land too dry for other trees. If cut back in the early years it will make the hedge more thorny. In western Nebraska it has been put at the head of the list of deciduous trees after some fifteen years' trial. The tree has proven hardy at Brookings, Milbank, Huron and many other places in the state. In the fall of 1897 at Uralsk, on the Ural river, a part of the eastern boundary line of European Russia, in latitude 51 degrees, the writer noticed a fine hedge of this tree, grown without irrigation. This place is on the dry, open steppes with much alkali in the soil, being a part of the Aral-Caspian depression, with an annual rainfall of only 12.6 inches. The hedge on the Station grounds at Brookings, shown in the plate, was set with one year seedlings in the spring of 1896, and has borne seed two years. Three trees set some ten years in a clump of shrubbery on the College campus have not been pruned and are now 25 feet in height. A specimen standing in sod, but irrigated, at Huron, has attained a height of some thirty-five feet in ten years.

Numerous tubercles are found on the roots of this tree and some European authors consider it a case of symbiosis or copartnership with nitrogen-forming bacteria, enabling the tree to get nitrogen direct from the air.

PROPAGATION: The easiest method of propagation is by seed. The small silvery berries should be picked in the fall before being taken by the birds and soaked for one day, this softens the pulp so it can be easily washed off. The pits are then mixed with moist sand in a small box with holes in the bottom for drainage. We prefer to use a box not more than a foot deep. The box may be put in a cool cellar until winter comes, or it may be buried at once two or three inches below the surface with mulch over to prevent drying out. When winter comes care should be taken that seed be

thoroughly frozen by removing most or all of the mulch. This process of burying in sand is called stratifying by nurserymen. The seeds germinate at low temperature and should be sown in drills as early as possible in the spring. Some prefer to sow the seed at once when gathered in the fall, but on heavy clay soil trouble would ensue by seed being heaved out by the frost, and also by freezing too dry in snowless winters. The seed heats very quickly if put in piles when first picked, so it must be spread out in thin layers to be cured before it is safe to ship.

This valuable tree is now generally propagated by Dakota nurserymen and sold at reasonable rates. This Station has sent out many trees for trial in this state during the past four years, but this work has been discontinued as the nurserymen have taken up the work and we are busy with other new plants.

T. L. McCrea, of Tyndall, S. D., in reply to our inquiry, writes under date of December 29, 1899: "It was first introduced in Bon Homme county by the Russian Mennonites. Ten years ago I procured a few bushels of seed and sowed it thick in rows about four feet apart. I sold only a part, taking up clean as far as I went. The balance (a fine grove) has stood as it came up without thinning or trimming, through the dry summers and cold winters and is perfectly healthy today. It is very ornamental with its silvery leaf, fragrant blossoms, and clusters of berries or seed. As a hedge it will turn any stock that osage orange will. Horses or cattle will not attempt to go through it, and it does not sap the ground like the osage orange."

FOREIGN NOTES: Sometimes notes of methods followed in other countries are of interest, even if not always fully applicable to our conditions.

The following is condensed from a translation* from a pamphlet by N. K. Sredinsky, (Kharkhof, 1887) a Russian government forester and horticulturist, who has experimented largely in planting hedges for snow-breaks along the railroads in European Russia: "A valuable tree for hedges in south Russian steppes. For snow-breaks along railroads I plant the 'wilde Oelweide' (wild Oilwillow, the German-Russian for Oleaster) where stock would kill other trees, as it is not browsed by stock. This species, (*E. angustifolia*, L.) is native of eastern Transcaucasia and central Asia. Specimens in south Russian gardens are about twenty-eight feet in height and 21 inches in diameter at a man's height from the ground. The trees bear fruit the sixth year from the seed. When a tree is cut down to the

*Translated for me from Russian into German by a translator at the St. Petersburg Botanic Gardens, and by the writer from German into English.

ground the fifth year, a great mass of strong sprouts are produced which attain a height of seven feet the first year and are armed with long thorns. Rabbits, as well as domestic animals, do not attempt to go through such a hedge and it is shunned by various insects injurious for the garden and field. Sow seeds in beds thirty-two inches wide, rows ten and one-half inches apart, not more than one and one-fourth inches deep, and so they do not touch one another Sow seeds in fall. In winter the beds are covered with five inches of straw, which remains until the seeds germinate in the spring, when it must be removed. This mulching is necessary as it prevents premature germination and consequently injury from late spring frosts Use decayed straw as it is free from weed seeds. Early in April the mulch should be removed, except a very thin layer which the seedlings are able to penetrate. The germination is regular and no watering is necessary during spring and summer. Weeding must be promptly done. The young shoots of this tree do not suffer from the morning frosts of May as do often the shoots of Fraxinus, Acer platanoides, Carpinus and other species. If the seeds are not planted in the fall, they must be stratified in layers of sand where they will freeze over winter. Upon planting early in spring care must be taken to prevent the seeds losing the moisture imbibed during the winter. As soon as planted, water beds thoroughly and cover with straw to be removed as soon as the young seedlings show.

For a hedge the soil should be plowed ten inches deep and harrowed. If several rows are planted the rows should be ten and one-half feet apart and a strip kept cultivated a similar distance from the outside rows. Set plants with a line, making the holes with dibbles or spades. The plants are set in the spring, ten and one-half inches apart in the rows and one and three-fourth inches deeper than they stood in nursery, and the soil is so firmed about the roots that they are not easily pulled up. Fall planting is not recommended; when it appears unavoidable it is very necessary to mound up the earth around the stem to protect the roots in case the following winter is nearly without snow. The hedge must be thoroughly cultivated three times each season for the first three years, until the branches grow together and keep down weeds. During the first years, the tree forms a single trunk thickly set with branches. In order to give the necessary form of a woven (plashed) hedge, the main stem must be cut to the ground the fifth year, for the most part this is done at the close of winter. In the spring, at the place where the stem has been sawed off, appear a large number of shoots, which soon attain a good height, thickly set with thorns and forming a strong impenetrable mass of interwoven branches. When after some years occasional ones of these shoots have again formed thick stems and crowd their neighbors, they must be cut down to the ground again, when again a yet stronger, more impenetrable, interwoven mass of branches appear, which in the first year attain a height of over seven feet. Sredinsky in conclusion states that this tree is said to be propagated also by cuttings and stolons, which methods he, however, has not used, but doubts the practicability of growing the trees from cuttings on elevated places on the steppes, and that propagation by seed is easier than by any other method."

Elæagnus angustifolia media, Hort. A hardy tree ten feet in height which has not yet blossomed.

Elæagnus angustifolia orientalis, Schldl. Oriental Oleaster. This is a variety from Turkestan with fruit about one inch in diameter. The writer found the fruit much used in Turkestan but thought the berries, although sweet, were too dry to win favor here. In a visit to the Royal Horticultural school of Potsdam near Berlin in 1894 the writer found specimens of this tree sent from Turkestan by a graduate then in the employ of the Russian government in Turkestan. Scions were secured and grafted on Russian Olive seedlings at the Iowa Agricultural College, two of these trees were planted at this station in spring of 1896, but have not proved sufficiently hardy.

Elæagnus argenta, Pursh. Silver Berry. Native from Canada south to Minnesota, Dakota and Utah. A handsome shrub with large leaves, silvery on both sides; small, yellow, fragrant blossoms and silvery berries. The bush sprouts from the roots. This species is native in the Black Hills along the upper Missouri.

Elaegnus longipes, Gray. (*E. edulis*, Hort.) Japan Oleaster, Goumi. Native of Japan and China. A choice shrub with edible, slightly acid berries. Winter-killed at this station. Reported tender at Madison by A. Norby and at Yankton by C. W. Gurney.

Euonymus atropurpureus, Jacq. Burning Bush, Waahoo. Native of eastern North America west to Montana. In Dakota it is found along the Missouri river eastward. A handsome ornamental shrub, with small purple flowers in June followed by scarlet fruit. The branches are four-sided.

Exochorda grandiflora, Lindl. Pearl Bush. Native of northern China. Not in Station collection at Brookings, but reported half-hardy at Mitchell and Madison.

Fagus. All kinds of beech trees are conspicuous by their absence in northwestern catalogs, owing to entire lack of hardiness.

Fraxinus Americana, Linn. (*F. Novæ Angliæ*, Mill.,

F. alba, Marsh.) White Ash. From Canada to Florida west to Minnesota and Texas. This tree has done well in timber plantations of this Station. If it occurs native in this state at all it appears only to be in the Minnesota or Sioux river regions, and to be very rare.

Prof. S. B. Green, in his "Forestry in Minnesota," a work which should be in the hands of every prairie planter, writes of this species, "A large and valuable tree commonly confounded in this section with the Green Ash and Red Ash, both of which, however, are smaller trees and much hardier, produce seed at an earlier age and in larger quantities and altogether are better adapted to prairie planting than the White Ash."

Fraxinus excelsior, Linn. Native of Europe and west Asia. This species of Ash winter-kills badly and is worthless. Our specimens from Germany, planted in spring of 1896, are now only three and one-half feet in height.

Fraxinus lancolata, Borkh. Green Ash. This is native throughout the state. Native trees from this vicinity have done well under cultivation at Brookings. The trees endure severe drought on dry knolls and are very tenacious of life. Of rather slow growth at first but is one of the most valuable of trees for the lawn and groves.

Fraxinus Pennsylvanica, Marsh. (*F. pubescens* Lam.) Red Ash. Native of Canada to Florida west to Dakota and Missouri. Abundant with the Green Ash throughout the state.

Prof. Green in "Forestry in Minnesota," writes: "The Green Ash closely resembles the Red Ash, from which it is distinguished in extreme forms by its glabrous leaves and branchlets and by its rather narrower and shorter and usually more serrate leaves, which are lustrous and bright green on both surfaces. However in western Minnesota and the Dakotas these species run together and are often indistinguishable. The flowers and fruit of the two species are alike although many forms occur on each. Professor Sargent regards the Green Ash as a variety of the Red Ash. * * * It is probable that about all the Ash in western Minnesota and the Dakotas is Green Ash or a hopeless mixture of it with Red Ash.

Hydrangea paniculata grandiflora, Sieb. Native of Japan. A number of young plants set in the spring of 1896 did not prove hardy in nursery row without winter protection. It is one of the choicest of all shrubs, with large panicles of white flowers over a foot in length in August and

September, when flowers are scarce. Experience elsewhere indicates that when well established and given suitable mulching, watering and winter protection it will give satisfaction, at least in the southern part of the state. It is reported hardy at Sioux Falls and Mitchell, and among the "less hardy or tender" at Madison.

Gleditschia triacanthos, Linn. Honey Locust, Three-thorned Acacia. From Pennsylvania south to Mississippi, west to Nebraska and Texas. In this state found native along the Sioux river in the south-eastern corner of the state. The general experience with this valuable tree further north in the state is not satisfactory. Reported hardy at Yankton by C. W. Gurney, and at Mitchell by E. C. Newbury, and at Vermillion by E. D. Cowles. Prof. S. B. Green reports it as not generally hardy in Minnesota.

Gymnocladus Canadensis, Lam. (*G. dioica, C. Koch.*) Coffee Tree, Kentucky Coffee Tree. Native from southern Ontario to Pennsylvania, Tennessee, Minnesota, Nebraska and Indian Territory. This tree is named from the fact that the seeds were used for coffee west of the Alleghanies before and during the Revolutionary War. In this state it is found native in Clay and Union counties, and has been reported in the Sioux valley as far north as Canton. It is a rare tree in southern and southeastern Minnesota, extending north to St. Paul and west to New Ulm. This tree is a handsome ornamental tree with large compound leaves and coarse branches. The large flat pods contain seed over half an inch long. It was planted at this Station about ten years ago but it is not now in the collection. Reported half-hardy at Mitchell (Mr. Newbury), and Yankton (Mr. Whiting); hardy at Vermillion (Mr. Cowles) and Yankton (Mr. Gurney).

Hibiscus Syriacus, Linn. Shrubby Althæa. Rose of Sharon. "Nativity uncertain, but probably not Syrian, as Linnæus supposed; probably native in China" (Bailey). Not in the Station collection; reported winter-killed at Vermillion and Yankton. Generally considered tender in the Northwest.

Hippophae rhamnoides, Linn. Sea Buckthorn, Swallow Thorn. A thorny, silver-leaved shrub, attaining a height of twenty feet. Native throughout Europe, along lakes and mountain streams in the Caucasus, northern Persia and the Ural, Altai and Baikal sections of Siberia. Hippophæ is Greek, "meaning horse-killing," according to A. P. Wyman in Bailey's Cyclopedia, "alluding to the berries, which are somewhat poisonous." In Siberia the plant is used for hedges and the acid, orange-yellow berries are much used for culinary purposes and are not considered poisonous. The French form of this species winter-killed at St. Petersburg, Russia, while the form from Irkutsk, on Lake Baikal, Siberia, proved hardy. Many plants of this Irkutsk form, secured by the writer at St. Petersburg for the United States Department of Agriculture in 1897, proved perfectly hardy, have been once transplanted, and bore this year. The plants make a neat silvery hedge. The German name "Sanddorn" is brief and suggests "Siberian Sandthorn" as the name of this Irkutsk form.

Fr. Th. Koeppen* writes: "The berries are of pleasant acid taste and form the favorite food of the pheasants which find a favourite habitat in the often extensive Sand Thorn thickets. They serve as table dainties and especially in Siberia for the manufacture of cordial. The Sand Thorn is also used for hedges, and also as a soil binder in sandy soils."

Juglans cinerea, Linn. Butternut, White Walnut, Native from New Brunswick to Georgia, west to Minnesota and Arkansas. In Minnesota it extends north to Aitkin county and west to New Ulm. Brookings is beyond the natural limits of the Butternut; if found native in this State at all it must be very rare. The experience at this Station does not enable us to recommend the Butternut. Reported hardy at Mitchell, Vermillion and Yankton; not reliable at Madison; tender at Gary and Huron. The source of seed of Black Walnut and Butternut will be found to have some relation to hardiness; and transplanting should be avoided if possible.

*Beitraege zur I Kenntniss des Russischen Reiches und der angrenzenden Laender Asiens. V. P. 646, St. Petersburg, 1888.

Juglans nigra, Linn. Black Walnut. Native from Massachusetts to Florida, west to Minnesota and Texas.

Prof. S. B. Green writes in "Forestry in Minnesota:" "In Minnesota formerly a common tree along the creek and river bottoms of the southern part of the State and in a few locations is still rather abundant."

The northwestern limit appears to be along the Minnesota river near New Ulm, Minnesota. In South Dakota it is found native in the southeastern corner of the State in Union county. A grove near Milbank from New Ulm, Minnesota, seed has done well for some fifteen years past. The experience at Brookings and elsewhere does not enable us to recommend the Black Walnut, at least for open exposure in the larger part of the State. Reported hardy at Yankton, Vermillion, Rapid City, half hardy at Mitchell, not hardy at Madison, Gary, Huron and Forestburg.

Juglans Mandschurica, Maxim. Native of Manchuria and the Ussuri and Amur sections of Siberia. This species of Walnut kills to the ground in severe, but not in ordinary winters.

Larix decidua, Mill, DC. (*L. Europæa*, DC.) European Larch. Native of northern Europe and the Alps of central Europe. A graceful lawn tree. A conifer, but for horticultural purposes is reckoned with deciduous trees as the leaves fall in autumn. Only a small proportion of those originally planted at this Station are standing. It is subject here to injury of the new growth from late frosts. The European Larch does better on dry land than the American Larch, but the general experience with it on northwestern prairies is unfavorable. A moist soil and sheltered locality are needed. The Larches must be planted very early in spring, before the buds start, to ensure a good stand.

Larix Sibirica, Ledeb. (*L. Europæa Sibirica*, Loud; *L. Europæa Rossica*, Regel.) Siberian Larch. In Russian government forestry planting on the steppes this has been found much superior to the European Larch. Two specimens received from Russia in the spring of 1898 through the

United States Department of Agriculture have proven perfectly hardy so far in open exposure.

Lespedeza bicolor, Turcz. Two-colored Bush clover. Native of northern China, Japan, Manchuria, Mongolia and Corea. A shrub five feet in height with slender graceful branches and small leaves. The bushes kill-back about one-third but flower freely every year from young shoots of old wood. Not a showy bush, but the numerous side shoots are full of racemes of small, purple and rose-colored pea-shaped flowers which are used for small bouquets. Flowers appear all summer beginning early in July.

Ligustrum Ibota, Sieb. (*L. obtusifolium* Sieb. and Zucc.) Native of Japan. Of three specimens planted, one

PLATE III—LONICERA ALBERTI IN BLOOM.

winter-killed and the others were killed to the ground. Not sufficiently hardy.

Lonicera Alberti, Regel. (*L. Spinosa*, Jacq.) Native of the high mountains of eastern Turkestan. Discovered by Albert Regel and disseminated by the St. Petersburg botanic gardens. A choice, very hardy shrub, now three feet in height and five feet across, of peculiar habit; the long, slender branches are trailing, but the center of growth rises a little higher each year. The bush forms a very dense, rounded mass of bluish-green foliage; the leaves are small and linear; blossoms rose-pink, fragrant. In bloom the latter part of May and first half of June.

Lonicera bella albida, Zabel. (Zabel is a horticulturist in Germany who has done considerable work in hybridizing shrubs.) A hybrid variety (*L. Morrowi X Tatarica*). A hardy shrub now seven feet in height; of spreading habit, very distinct because of its small bluish leaves. The white flowers in June are followed by red berries, which are mostly taken by the birds. Worthy of cultivation.

Lonicera bella atrorosea, Zabel. Much the same as above, blossoms dark pink, berries red. Height eight feet, a large spreading bush of open habit. A hardy shrub, much like *L. Tatarica*, but not so compact.

Lonicera bella candida, Zabel. A hardy variety of strong spreading habit; flowers white, berries red. Height now eight feet. Leaves rather small, bluish green.

Lonicera bella incarnata, Zabel. A large spreading bush now seven feet in height, a profuse bloomer, blossoms pink. In bloom from late May to early June. Hardy and desirable.

Lonicera bella rosa, Zabel. A very free bloomer. The showy rose-colored blossoms are followed by red berries, bush of open habit and strong growth. Hardy. Height seven feet. Needs pruning at the tips. The heavy crop of berries is mostly taken by the birds.

Lonicera cœrulea, Linn. Native in the Alps and mountains of central Europe in northern Europe and northern Asia, Canada westward to Alaska as well as in the mountains of northern United States and mountains of California. A variable species; the numerous varieties are divided into nine groups by Dippel. A hardy bush, now three feet in height, of dense habit. The yellowish white flowers appear during May and are followed by blue black berries, the leaves are bluish green.

Lonicera cœrulea graciflora, Dipp. A hardy bush now four feet in height. The bluish green foliage and many-branched dark red young shoots give it a dense neat upright habit and distinct expression. Worthy of cultivation.

Lonicera cœrulea Kirilowi, Hort. This is variety *viridifolia* of Dippel. This variety forms a dense roundish compact bush four feet in height with numerous dark red branches and lively green leaves. Flowers yellowish white in May and early June followed by bluish berries. A hardy bush of distinct habit.

Lonicera cœrula praecox, K. Koch and Hort. The name *praecox* probably refers to its early leafing and blooming. A hardy bush now three feet in height, of dense habit. In bloom during the first half of May.

Lonicera cœrulescens, Dipp. A hybrid bush honeysuckle, height now five feet, hardy, of dense strong growth, young leaves are light green, changing to a dark bluish-green. Free bloomer, blossoms small carmine pink, from the middle of May to early June. Dippel states that this is closely related to *L. micrantha*, Regel; Koehne and Rehder that it is probably a hybrid (*L. tatarica X. Xylosteum*).

Lonicera Iberica, Bieb. Native of southern Russia, northern Persia and western Asia. A dense compact bush three feet high and five feet across. The small gray-green pubescent leaves give the bush a distinct appearance. Kills back at tips and sometimes one-half, but appear hardy

enough for a place in a large collection, but not enough to recommend for general cultivation.

Lonicera micrantha, Regel. Native of Turkestan. Height six feet of open spreading habit; needs pruning. Hardy shrub with pink flowers in May and early June; not a free bloomer Berries red. Not quite as desirable as *L. Tartarica.* Rehder refers this to *L. floribunda;* Koehne is not yet convinced of this (p. 550).

Lonicera minutiflora, Zabel. A hybrid variety (*L. micrantha X Morrowi*). Height eight feet, hardy, of spreading habit. Small yellowish white blossoms in late May and early June followed by yellow berries.

Lonicera notha alba, Zabel. *L. notha* is considered by Koehne to be a hybrid (*L. Ruprechtiana X Tatarica*). A hardy bush of strong growth, height six feet, flowers yellowish white, appearing in May, followed by red berries.

Lonicera notha carnea, Hort. A hardy bush of dense spreading habit and rank growth. A free bloomer during May, flowers flesh-colored, followed by small red berries.

Lonicera notha carneo-rosea, Zabel. Height nine feet. A hardy bush of very upright habit, not a free bloomer; blossoms yellowish red in late May and early June; berries red.

Lonicera notha gilva, Zabel. A variety with yellowish white flowers, not specially desirable.

Lonicera notha grandiflora, Zabel. A strong growing bush seven feet in height, hardy and desirable. Large, yellowish flowers in May; berries red.

Lonicera nummulariæfolia, Jaub. and Spach. Native of Persia; Turcomania, Turkestan and also occurring in Spain. A bush five feet in height with light gray green leaves of thin open habit and some dead shoots. Pink flowers. Not recommended.

Lonicera orientalis, Lam. (*L. Caucasica,* Pall.) Native in the Orient and the high mountains of India and

probably also in eastern Asia. A hardy bush now five feet high with large dark green leaves. The foliage is neat but the pink blossoms in late May and early June, followed by small blue black berries, are not especially conspicuous.

Lonicera orientalis f. e. China, Dipp. A Chinese form of this Asiatic species. Height four and one-half feet, neat and distinct in foliage but kills at the tips and is not a free bloomer. This and the two following are classified as forms of *L. orientalis longifolia* by Dippel.

Lonicera orientalis f. ex. India, Hort. Bush five feet in height. Habit thin and open, due to the killing back of the young branches. It is sufficiently hardy to produce a few blossoms and berries but is too tender to recommend.

Lonicera orientalis Kamtschatica, Hort. This is a Kamschatkan variety of the oriental honeysuckle. A hardy bush now three and one-half feet in height, with neat clean habit and dense foliage. Blossoms pink, small, in late May and during June.

Lonicera parvifolia, Hayne. The habitat is said by Dippel to be the same as *L. Tatarica*, and that it is often confused with white flowered form of that species, but it is quite distinct. Koehne mentions it as perhaps a hybrid. Rehder in Bailey's Cyclopedia refers it to *L. tatarica*, Jaeger. A hardy strong growing bush seven feet in height, a profuse bloomer in late May and early June. Flowers white followed by yellow berries. Desirable.

Lonicera Periclymenum, Linn. (*L. Germanica*, Dietr., *Caprifolium Periclymennm*, Roem. et Schult.) Woodbine. Native of central and southern Europe, north Africa and the Caucasus. A choice hardy climbing honeysuckle with fragrant flowers red outside and yellowish within; the main period of bloom is during June.

Lonicera salicifolia, Zabel. Koehne says this is a hybrid (*L. Micrantha X Ruprechtiana*). A hardy shrub now

seven feet in height, of dense, somewhat spreading, habit; leaves broad, willow like.

Lonicera sempervirens, Linn. (*Caprifolium sempervirens*, Michx.) Trumpet Honeysuckle. Native from Connecticut to Florida, west to Nebraska and Texas. A beautiful high-climbing vine with scarlet trumpet-shaped flowers and red berries. In blossom all summer. Not in the Station collection but has proved hardy in a private garden at Brookings.

Lonicera Tatarica, Linn. Tartarian Bush Honeysuckle. Native of Siberia, Tartary and southeastern Russia. A bush twelve to fifteen feet in height which has proven perfectly hardy in the Dakotas, Minnesota, Manitoba and Assinaboia. This shrub has been in cultivation for many years and there are now numerous varieties differing in foliage, habit and blossom. It is one of the first shrubs that should be planted by prairie settlers on the lawn and for ornamental screens and hedges. It is easily propagated by planting cuttings in the fall the same as currants and willows. A very variable species. Under cultivation many varieties have appeared; all those tested here have proved hardy.

Lonicera Tatarica alba grandiflora, Hort. (*L. Tat. alba*, Regel, *L. Tat. albiflora*, var.) A very free bloomer blossoms pure white. In July it is very showy from its immense crop of red berries. Present height eight feet; a strong rank grower, very desirable.

Lonicera Tatarica albo-rosea, Spaeth. Height seven feet, of strong growth, flowers pale pink, berries red. A very free bloomer.

Lonicera Tatarica angustifolia, Kirchn. (*L. Tat. angustata*, Hort; *L. angustata*, Wender.) Present height five and one-half feet, of strong growth, hardy, a profuse bloomer, flowers pink, berries red. Very attractive, both in flower and fruit.

Lonicera Tatarica discolor, Hort. Present height six feet; a strong grower, hardy. A very profuse bloomer;

flowers large, rose pink and dark red ; berries bright yellow, very showy. Desirable.

Lonicera Tatarica fl. alba, Hort. Height seven feet, hardy, of strong growth. Very free bloomer ; flowers white, berries red. Choice and desirable.

Lonicera Tatarica fructu lutea, Hort. Height five feet, hardy. A profuse bloomer, blossoms white, berries yellow. Attractive.

Lonicera Tatarica fl. rosea, Hort. Height nine feet, of strong growth and upright habit, a very profuse bloomer, blossoms rose color, berries red. Very choice.

Lonicera Tatarica fl. rubra, Hort. (*L. Sibirica*, Hort.) Present height five feet (growing next to roadway). Hardy ; a profuse bloomer, flowers deep pink, very attractive, berries red.

Lonicera Tatarica gracilis, Hort. Height seven feet. A hardy, bush of strong upright growth, a free bloomer through May and early June. Flowers large and white with pink cast, followed by red berries.

Lonicera Tatarica pulcherrima, Hort. Height six feet, hardy, of strong growth. "Pulcherrima" means "most beautiful," a very profuse bloomer in late May and nearly through June; flowers dark pink.

Lonicera Tatarica rosea floribunda, Spaeth. Height six feet, a strong-growing hardy bush with clean foliage. A very profuse bloomer, flowers rose-pink, berries red. A beautiful bush in blossom, fruit and foliage.

Lonicera Tatarica splendens, Spaeth. Height seven feet. Hardy and of strong growth, a very profuse bloomer, blossoms a rich dark red in the bud changing to striped pale pink and white. Berries bright yellow, very ornamental. One of the best varieties.

Lonicera Tatarica virgindalis grandiflora, Hort. Large flowers, striped and marbled pink and white. Hardy, present height five feet, of upright habit. Berries red.

Lonicera Xylosteum, Linn. Native of Europe, the

Orient and Siberia. Flowers yellowish white, blooming in May, berries dark red. This bush kills at the tips and is not as desirable as the Tartarian Bush Honeysuckle.

Lycium Chinense, Mill. Chinese Matrimony Vine, or Box Thorn. A native of the more temperate regions of China. In the severe winter of 1898-99 our specimens were killed to the ground but otherwise appear hardy. A trailing bush four feet in height with long slender somewhat spiny branches, forming a dense mass of green foliage seven feet across, full of small dull purple flowers and oval red berries all summer and fall. A bush of somewhat weedy character, sprouting badly from the root among adjoining plants. The Box thorns are used for covering foundation walls, fences and trellises, especially where there is opportunity for the brances to hang over a wall or similar support.

Lycium halimifolium, Mill. Native of China. Height three and one-half feet. A very dense mass of slender trailing branches and grayish green leaves covered with dull purple flowers and red berries all summer and fall. Hardy.

Lycium rhombifolium, Dipp. A native of China. This is much like *L. Chinense.* Sprouts badly and is rather weedy.

Maclura aurantiaca, Nutt. (*Ioxylon pomiferum*, Linn.) Osage Orange. Native of Indian Territory, Texas and the southwest. The Osage Orange is not hardy in northern Iowa, Minnesota and the Dakotas; south of that it is popular with many for hedges which become stock-proof if properly trimmed. Some agents claiming to represent eastern nurseries canvassed many parts of the Dakotas and Minnesota last year, taking orders for "Siberian or Russian Pea trees" or "Russian Osage," but the samples sent to the writer for determination were in all cases common Osage Orange. There is no such plant as Russian Osage in existence, Osage being strictly an American plant.

The name *Ioxylon* has priority but has not yet been generally accepted by nurserymen.

Menispermum Dahuricum, DC. Siberian Moonseed. Native of the Amur and Ussuri river regions in eastern Siberia, Manchuria and north China. As received from St. Petersburg this is a very hardy, neat little climbing vine, with smaller, deeper green leaves than the native Moonseed. (*M. Canadensis*, Linn.)

Morus alba, Linn., var. *Tatarica*, Loudon. Russian Mulberry. This was introduced into Nebraska and other western states during 1875-1877 by the Russian Mennonites. It was at first highly recommended by some western nurserymen as desirable for fruit, shelter-belts and timber, but experience shows it is of value mainly for low windbreaks to catch the snow, and the fruit of value only to feed the birds which prefer it to more valuable fruit. The fruit varies in size and color on different trees, but is mostly very small and insipid. However, some housekeepers make good use of the fruit by mixing it with more acid fruit. The tree is sufficiently hardy in the southern part of the state, fruiting satisfactorily as far north as Turner county. At Brookings the trees kill back too much to be desirable.

Morus nigra, Linn. Black Mulberry. Native of western central Asia. As received from Turkestan the young trees kill to the ground. The large-fruited black mulberries grown in the eastern states, are not hardy in the Northwest.

Morus Tatarica pendula, Hort. Teas' Weeping Russian Mulberry. This is a beautiful weeping variety with long slender branches pendent to the ground. Not in the Station collection; reported hardy at Yankton. The Minnesota Experiment Station reports it not sufficiently hardy for that vicinity.

Myrica Dahurica, DC. (Ehrbrg.). Native of Dahuria and the Transbaikal and Altai region in Siberia. A bush now three feet in height, killing nearly or quite to the ground every winter, but sprouting vigorously from the root. The

silvery, cedar-like foliage would be attractive for sprays and bouquets for decoration. The young shoots are tipped with small inconspicuous rose-pink flowers of no value. Closely related to Tamarix.

Phellodendron Amurense, Rupr. Chinese Cork Tree. Manchurian Cork Tree. Native of Manchuria, north China, Sachalin, and the Japanese islands of Nippon and Yezzo. A fairly hardy ornamental tree with spreading branches; light gray corky bark and large odd-pinnate leaves with three to six pairs or more of leaflets. The leaves and young wood have a strong pungent odor when bruised. The plant is free from insects.

Philadelphus, Mock Orange, Syringa. The Mock Oranges are beautiful, ornamental shrubs with opposite leaves, entire or saw-toothed and white, often very fragrant flowers. The name Mock Orange comes from their fancied resemblance to orange blossoms. The German name "Pfeifenstrauch," meaning pipe bush, refers to the woody stems which can be used for pipe stems when pith is removed. The common name Syringa is somewhat confusing as that is the botanical name for the lilacs. Koehne in a Monograph (Gartenflora 1896) describes thirty-three species, of which twenty are American, but for horticultural purposes the number of varieties to be considered is much larger, owing to the fact that numerous hybrids have originated under cultivation. It is a difficult group to determine as many of the species are not well defined. In this bulletin experience is reported with forty varieties. Of these sixteen winter-killed and are noted in the "Black List." Many of the following twenty-four varieties really belong to this list as they are too tender. In the southern part of the state some of them may do better, especially if winter protection is given them. As a group the Mock Oranges are not hardy and should be planted in a sheltered place. The names are given as received and

are those used in nurseries; the revised nomenclature is also given as it will probably be accepted by nurserymen in due season.

Philadelphus Columbianus, Hort. Native of north California, Washington and British Columbia. This is referred to *P. Gordonianus* by Dippel. Height one foot; too tender, killing to the ground every winter.

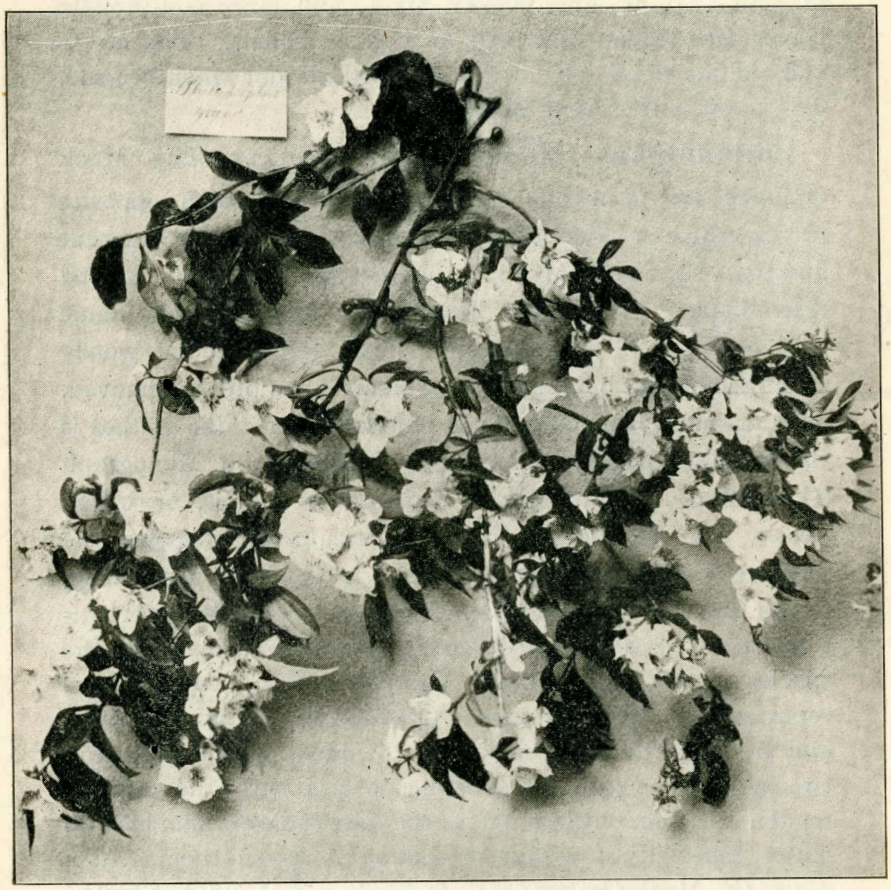

PLATE IV—A SPRAY OF PHILADELPHUS BLOSSOMS.

Philadelphus coronarius dianthiflorus plenus, Hort. Height now one and one-half feet. A dwarf bush with many young shoots; not desirable, as it kills to the ground every winter.

Philadelphus coronarius fl. pl., Hort. Height one and one-half feet. Kills nearly to the ground, sprouts weak Not hardy.

Philadelphus coronarius nanus, Mill. A low tuft six inches in height, killing to the ground every winter. Too tender.

Philadelphus coronarius tenuifolius, Rupr. A native of Manchuria, and the Amur and Ussuri regions of eastern Siberia. Height four feet. Young shoots tipped dark bronze green. The white flowers appear in late May and early June. Tips kill back a little.

Philadelphus coronarius Zeyherii, K. Koch. Height four feet. Kills back one half or more every winter, but produces a few flowers every year.

Philadelphus Gordonianus gracilis, Hort. The type is native of northern California to British Columbia. Height now five feet. Kills back considerably but not to prevent its flowering freely late in June and early July. Flowers white fragrant.

Philadelphus Gordonianus monstrosus, Hort. Height now five feet. Kills back considerably but is a free bloomer.

Philadelphus grandiflorus, Willd. Native of United States from Virginia to Florida and Tennessee. *P. inodorus*, Linn., is given priority in Bailey's Cyclopedia. This shrub kills back nearly every winter, but not enough to prevent its flowering freely.

Philadelphus grandiflorus speciosissimus, Hort. Height four feet. Kills back severely, but is a free bloomer.

Philadelphus undulatus, Hort. *P. laxus*, Schrad, is given priority in Bailey's Cyclopedia. Native from South

Carolina to Tennessee and Florida. Height four feet. Kills back, but has many strong sprouts. No flowers this year.

Philadelphus inodorus specious grandiflorus, Hort. *P. inodorus* is found native in the mountains from Carolina, Alabama and Georgia west to Tennessee. Height four and one-half feet. Too tender.

Philadelphus latifolius, Schrad. Native of eastern United States. Height four and one-half feet; kills back severely but has many strong shoots and is a free bloomer.

Philadelphus latifolius grandiflorus, Schrad. *P. pubescens*, Loisel is given priority in Bailey's Cyclopedia. Tennessee is named as the habitat. This bush kills back one-half or more, but sprouts strongly every year. Blossoms creamy white, not fragrant, appearing in late May and first half of June.

Philadelphus latifolius grandiflorus, Hort. Native of eastern United States. Height three feet. Kills nearly to the ground; too tender.

Philadelphus latifolius sanguineus, Musk. Height four feet. Kills back considerably, but not enough to prevent it flowering a little. Flowers small, white and slightly fragrant.

Philadelphus latifolius verrucosus, Hort. Kills nearly to the ground; too tender.

Philadelphus Lemoinei erectus, Lemn. A hybrid of *P. coronarius* and *P. microphyllus* produced by Lemoine of France in 1884. Height four feet, upright compact habit, slender branches, small delicate foliage. The fragrant snowy white flowers appear in early July. A graceful shrub which kills at the tips but is worthy of cultivation, especially if a sheltered place can be given.

Philadelphus Pekinensis, Rupr. Native of Mongolia and north China. A bush three feet in height, forming a dense mass of small-leaved shoots. Kills back one-third or more and hence a shy bloomer. Flowers yellowish white, somewhat fragrant.

Philadelphus pubescens, Loisel. Native of Tennessee. Height two feet. Kills to ground every winter, too tender.

Philadelphus pubescens Rafinesquianus, Musk. Height two feet. Kills to the ground, sprouts weak. Too tender.

Philadelphus Satsumi acuminatus, Lge. Native of China, Japan and the Himalayas. Height three feet; kills back severely. No flowers this year. Too tender.

Philadelphus Schrenkii, Rupr. Native of China, Japan and the Himalayas. Referred to *P. coronarius Satsumi* by Dippel. Height three feet, kills nearly to the ground; too tender.

Philadelphus Yokohamæ, Hort. Native of Japan. Height four and one-half feet. This shrub kills back, but blooms some every year in early July.

Populus. The Poplars and Arpens comprise some twenty-five species of trees native to the nothern hemisphere, and together with *Salix*, or willow, make up the willow family, *Salicaceæ*. The many kinds of Poplars planted at this Station have been tested mainly from the economic standpoint to determine their value for timber plantations upon the open prairie. The trouble with Cottonwood and other Poplars, is, that they are, to use a forestry term, "light-demanding" and not "shade-enduring." They also demand a moist soil with water not too deep beneath the surface. Hence, in closely planted groves on dry upland they prove short-lived. As single specimens, or in single rows, where the roots can secure more moisture and the tops light, than in plantations, they do much better. Poplars, especially Cottonwood and its Siberian relative, Certinensis Poplar, owing to their rapidity of growth, low cost and ease of propagation from cuttings, are valuable pioneer trees for the prairie planter upon suitable soil. However trees of more permanent character should replace them when means per-

mit. A discussion of their value as timber trees is given in "Forestry in Minnesota" by Prof. Samuel B. Green.† In a discussion, their value from the landscape gardening standpoint, Prof. L. H. Bailey,‡ writes:—

"The legitimate use of Poplars in ornamental grounds is the protection of minor or secondary effects. As a rule, they are less adapted to isolated planting as specimen trees than to use in composition,—as parts of general groups of trees, where their characters will serve to break the monotony of heavier foliage. The Poplars are gay trees, as a rule, especially those, like the Aspens, which have a trembling foliage. A few of them in judicious positions give a place a sprightly air. This is particularly true of the common Aspen, or *Populus tremuloides*, of our woods. Its light dancing foliage and silver-gray limbs are always cheering and its autumn color is one of the purest golden yellows of our landscape. It is well to have a tree of it standing in front of a group of Maples or Evergreens. Its whole attitude is then one of familiarity."

Populus alba, Linn. White Poplar, Abele. Native of central and north Europe, in Asia from the Caucasus and the Orient to northeast Asia. Hardy at Brookings. This tree is generally considered hardy in the northwest, but its strong disposition to sucker from the root is objectionable for ornamental purposes. The variety *nivea*, Wesm., (*P. argentea*, Hort., *P. nivea*, Willd.,) is a variety most common in this country. Sometimes, but erroneously called Silver Maple owing to its maple-like leaves. The snow white under surface of leaf make the tree too conspicuous to be used largely for ornamental planting. On the lawn the innumerable suckers are a nuisance. Not adapted for a street tree because the white down on the under side of the leaves and young shoot catch the soot and dust and gives the tree a dirty appearance.

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†Obtainable from Geo. W. Strand, Secretary Minnesota State Forestry Association, Taylor's Falls, Minn., and from A. W. Latham, Secretary Minnesota State Horticultural Society, 207 Kasota Block, Minneapolis, Minn. Price 25 cents.

‡Cyclopedia of American Horticulture, Vol. III, p. 1407. The Macmillan Co., New York, N. Y.

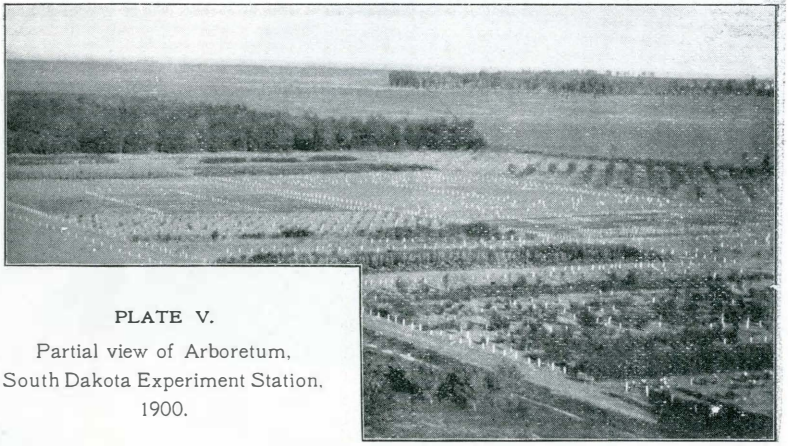

PLATE V.

Partial view of Arboretum, South Dakota Experiment Station, 1900.

The Horticultural Grounds comprise 60 acres; the College Campus, 20 acres; the College and Station Farm, 320 acres. Total, 400 acres.

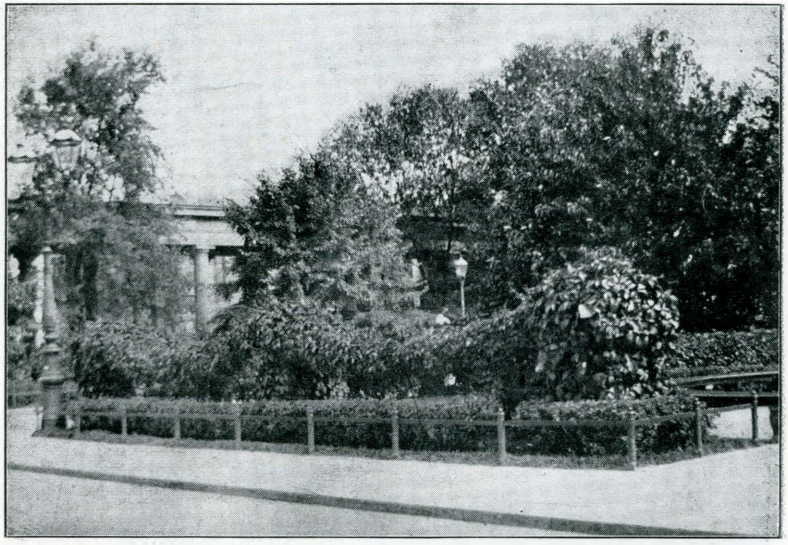

PLATE VI.

Virginia Creeper hung in festoons upon iron chains and posts in a park in Germany. A method common in the parks and gardens of Europe.

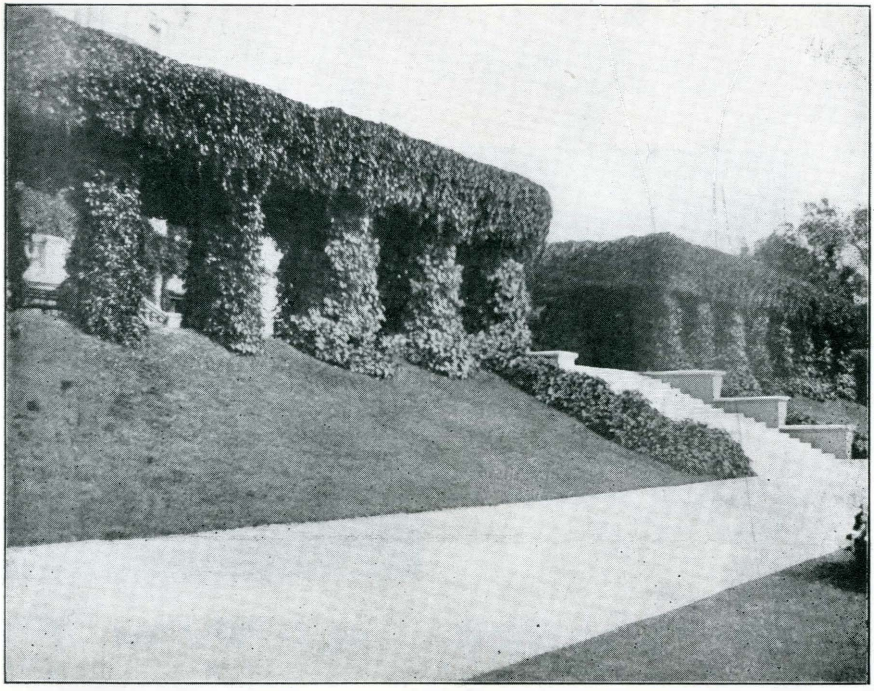

PLATE VII.

Some plants are more appreciated abroad than at home. A shady arbor like the above is a pleasant retreat on a hot day.

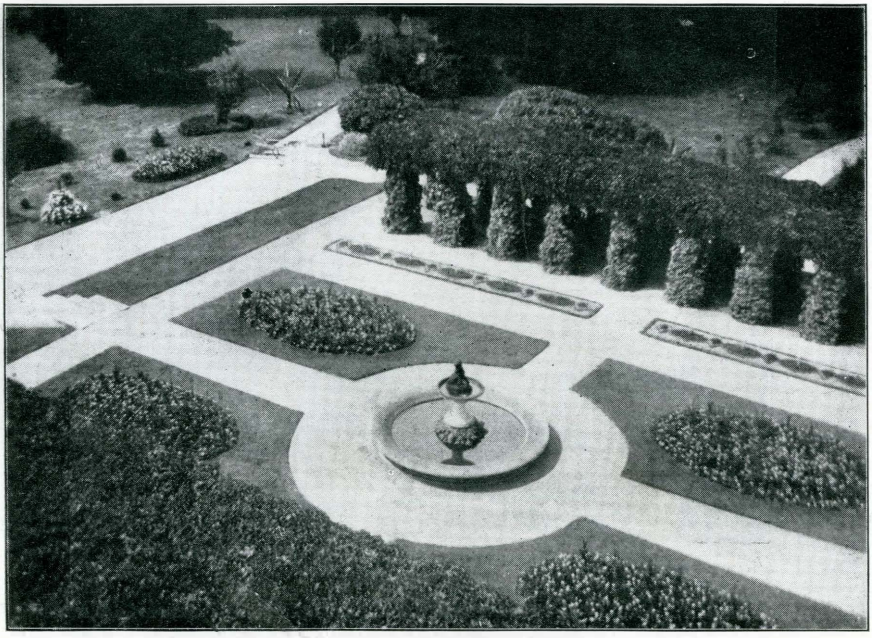

PLATE VIII.

The frontispiece, and plates 7 and 8, show what has been done with Virginia Creeper, a native South Dakota climbing vine, in the garden of a Russian Prince. For description, see under *Ampelopsis*.

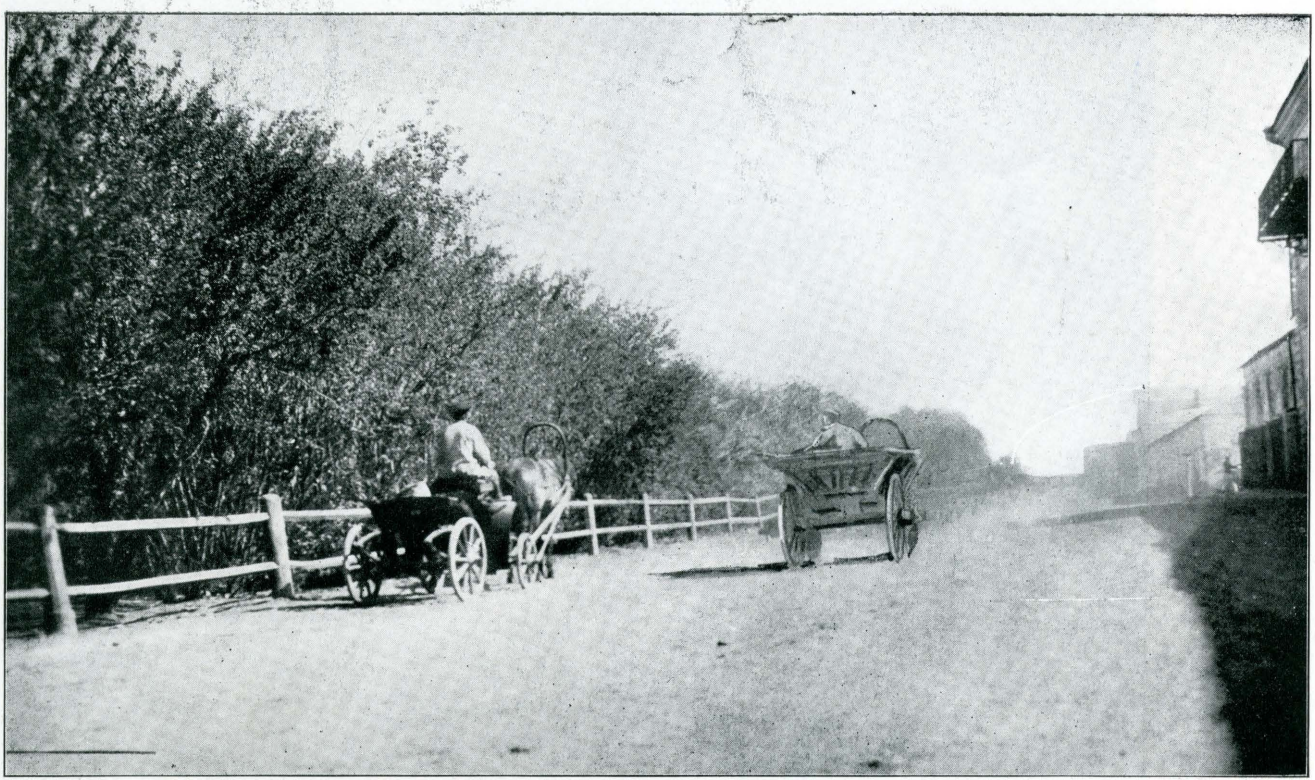

PLATE IX.

An old hedge of Caragana arborescens at Uralsk, Russia. Annual rainfall 12.6 inches.

PLATE X.

A hedge of Russian Oleaster or Wild Olive on the Station grounds. See under *Elæagnus angustifolia*.

PLATE XI.

On the Station grounds. Many varieties of Peonies at the left. A hedge or screen of Russian Artemesia at the right. A clump of Buffaloberry in the background in front of some Cottonwoods.

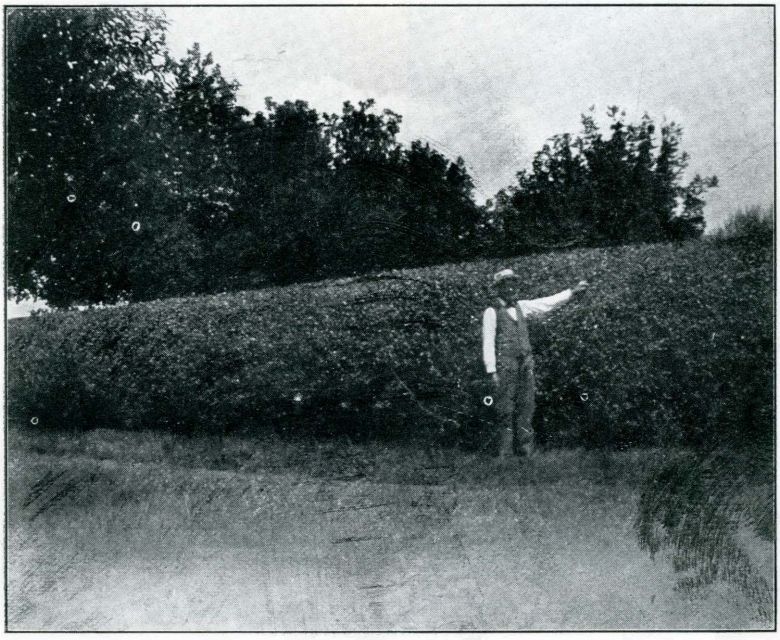

PLATE XII.

A Buckthorn hedge at Huron, South Dakota.

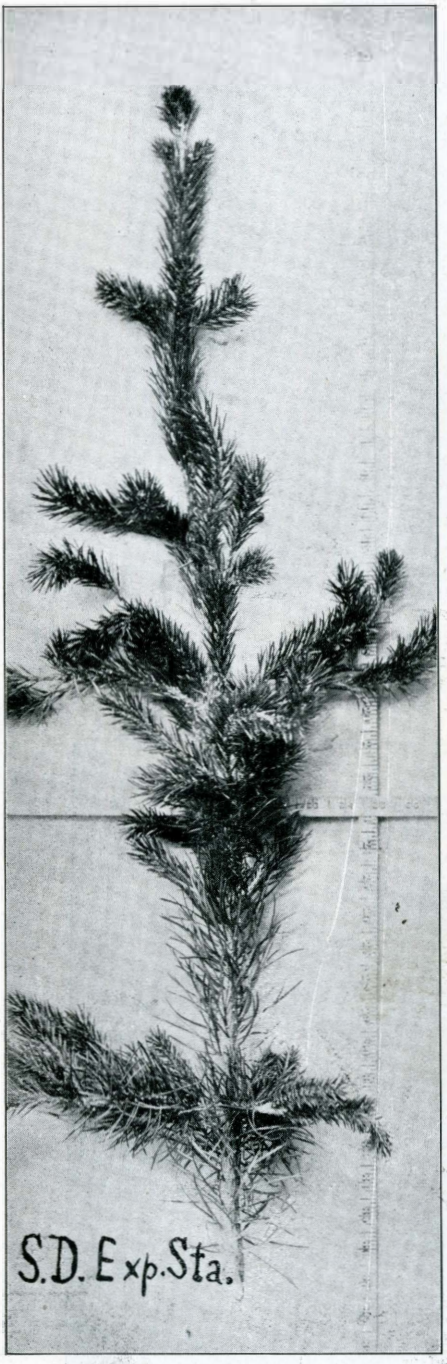

PLATE XIII.

Leading shoot of Jack Pine, showing habit of forming several whorls of leaves on the new shoots.

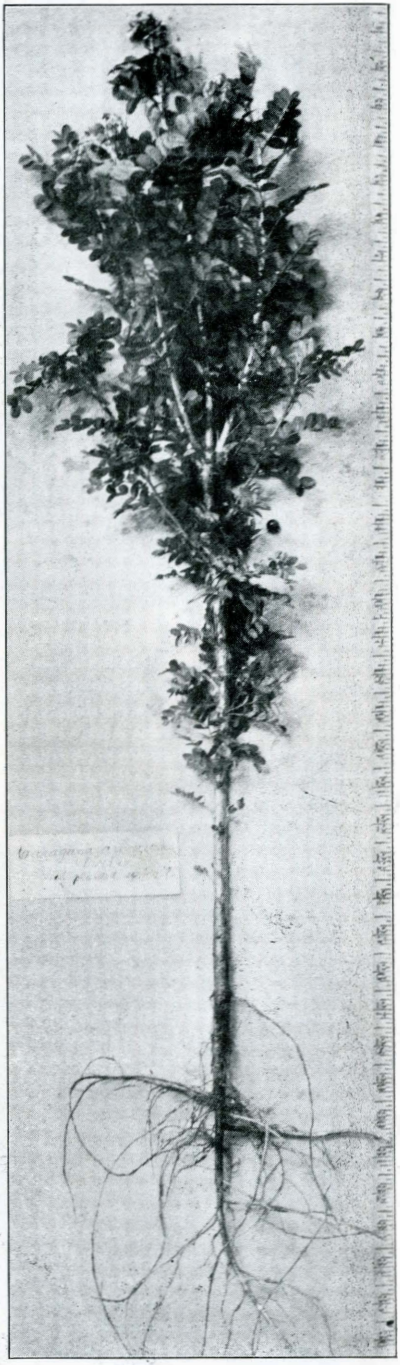

PLATE XIV.

A 14-months old seedling of Caragana arborescens, raised on the Station Grounds.

PLATE XV.

The Siberian form of Rosa rugosa, as imported by Prof. J. L. Budd.

PLATE XVI.

The Madame Charles Frederic Worth, a new Rose worthy of cultivation. It is a *Rosa rugosa* hybrid.

PLATE XVII.

A double-flowered form of *Rosa rugosa*.

PLATE XVIII.

The Cut-leaved Weeping Birch, the Queen of lawn trees for South Dakota. A choice specimen. planted fourteen years ago.

PLATE XIX.

Some fine Red Cedars at Brookings, South Dakota.

PLATE XX.

The "Golden Glow" Rudbeckia. This new American plant is winning great favor abroad as well as at home. Sometimes called the Summer Chrysanthemum.

PLATE XXI.

The tall tree at the left is a European White Birch, the round-topped tree at the right is a European Mountain Ash full of red fruit; White Elms and Birch in the background. On the campus of the South Dakota Agricultural College, Brookings.

PLATE XXII.

Spiræa lævigata gone to seed the last of June. A Siberian shrub worthy of cultivation.

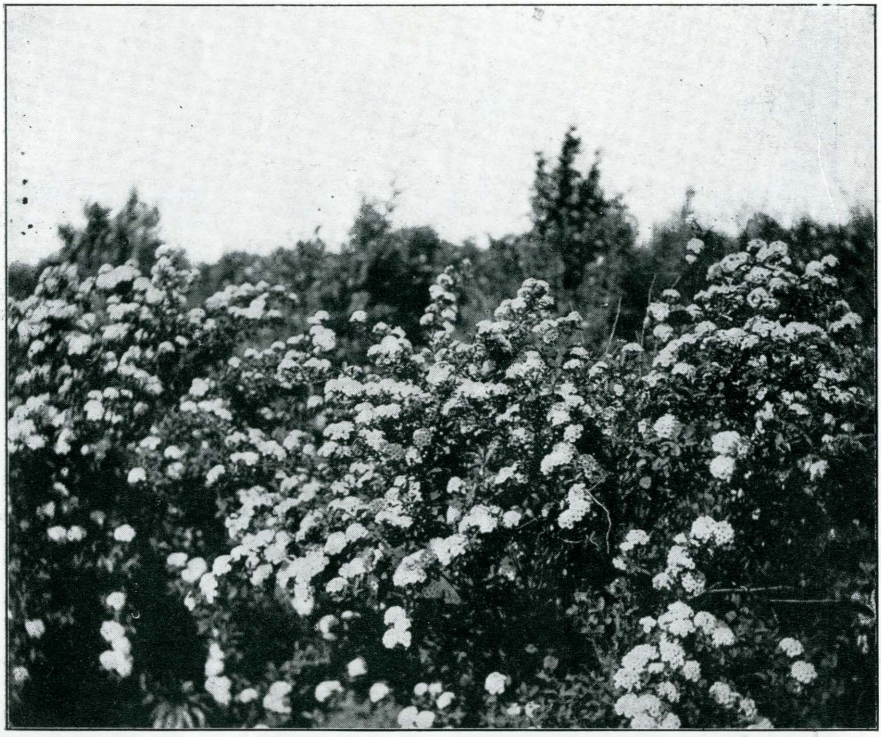

PLATE XXIII

Spiræa Van Houttei, a beautiful hardy shrub for the lawn, in full bloom in the Station Arboretum. The best shrub of its season.

PLATE XXIV.

Tamarix Amurensis. The middle spray shows the pink blossoms.

Populus alba Bolleana, Lauch. Bolles' Poplar. Dippel refers this to *Populus alba pyramidalis*, Hort. This tree was introduced into Europe in 1875 from Turkestan and named for Dr. C. Bolle of Germany. It has aptly been termed "a glorified Lombardy Poplar" being of similar tall, very upright narrow-topped habit of growth, but the foliage and color of bark is much more ornamental. The leaves are rather deeply lobed, dark green on upper surface, snow white beneath; the bark is silvery gray. This is the characteristic tree of Turkestan, the writer found it to be very common in the towns along the Trans-Caspian railway from the Caspian Sea to Bokhara and Samarkand. The tree was very common at Tashkent and was found to extend through northern Turkestan to Kuldja, western China (lat. 43°50′, long. 81°20′ east of Greenwich), the extreme eastern point of my journey. Specimens were noted over three feet in diameter and at least eighty feet in height. Some fine specimens were noted near some Chinese Mohammedan mosques. The habitat of this tree suggests its trial in the arid regions of the southwest for economic purposes.

Its ornamental value is summed up in Baileys' Cyclopedia as follows: "Its fastigiate habit, combined with the white foliage and shoots, makes it a most emphatic tree and there is a great danger of planting it too freely. Seems to be short-lived." The tree is not fully hardy at this Station, a large part of the original planting having disappeared but several trees that have become established are doing well.

American nurserymen have found the tree somewhat difficult to propagate, as it does not sucker from the roots and does not really grow from cuttings. The cuttings require to be calloused before planting. Grafting has been resorted to, but this is expensive. In Turkestan, it is found to grow readily from long cuttings stuck full length along the edge of irrigation ditches.

Populus balsamifera, Linn. Balsam Poplar. Tacmahac. Native from Newfoundland west to British Colum-

bia, southward into the northern tier of states; also of northeastern Asia. Probably the most variable of Poplars; the many varieties in cultivation have come both from native and Russian sources. In South Dakota it is native, in the the Black Hills and the Minnesota valley. A large tree of erect habit, with large resinous fragrant buds which are used in medicine; leaves heart-shaped, whitish beneath.

The Balm of Gilead, (*P. balsamifera candicans*, Gray) is native from New Brunswick to New Jersey west to Minnesota; is hardy at Brookings but sprouts more than is desirable. The rich dark foliage and spreading top makes it a better shade and street tree than most of the common Poplars.

Populus deltoides, Marsh. (*P. monilifera*, Ait.; *P. Canadensis*, Moench.) Cottonwood. Native from Quebec to the Rocky mountains and south to Florida. See general notes under the heading Populus. A tree widely planted in this state. For lawns of moderate size the Cottonwood grows too large and robs the soil of moisture needed by other trees. It is not a good neighbor for other trees. In the summer of 1898, a well at Brookings failed; examination showed it to be clogged at a depth of twenty-five feet with a mass of roots from a large Cottonwood tree close by; upon removal of the tree and the mass of roots the well resumed activity.

In the streets of Brookings there are many magnificent specimens about twenty years old, planted when the town was first laid out Old trees give very little shade, the top being too spreading and open and foliage too thin. The leaves rustle with the slightest breeze and are of light, cheerful aspect. There are no sombre tints among Cottonwoods; they suggest sunlight; motion, not rest.

In common with all Poplars, this tree is dicœcious, that is, the male and female flowers are not borne on the same tree. Hence the "cotton," which flies when the seed is ripe, can be avoided by planting trees grown from cuttings taken from staminate or male trees.

There is a golden leaved variety of the Cottonwood that is popular in Europe for park decoration, *Van Gertii* or *aurea;* it is not in the Station collection; reported hardy in Minnesota.

Populus deltoides Carolinensis, Bailey. (*P. Carolinensis*, Willd., *P. Carolina* and *Caroliniana*, Hort.) Carolina Poplar. A variety of the Cottonwood which is at present receiving considerable attention from nurserymen. Our specimens are too young for a definite report. It is a very strong grower of very upright, erect habit of growth, leaves more gradually taper-pointed and less triangular.

Populus laurifolia, Ledeb. (*P. balsamifera*, var., *laurifolia*, Wesm., *P. Certinensis*, *P. Petrovski*, *P. Bereolensis*, Hort.) Certinensis Poplar. Native of Siberia, especially in river valleys at the base of the Altai mountains. A hardy tree of very rapid growth, somewhat resembling the Cottonwood; the young vigorous shoots are strongly angled or grooved; the growth more close and erect; the leaves have wavy or ruffled edges and are on shorter, stiffer stalks. In the closely planted plats on the grounds of this Station Certinensis Poplar has not done any better than Cottonwood in being quite short-lived when crowded for room and water. Upon suitable soil with more space and access to water, both deserve to be planted.

Populus nigra Italica, Du Roi. (*P. dilatata*, Ait.; *P. nigra pyramidalis*, Spach.) Lombardy or Italian Poplar. Native of north Italy, the Crimea and the Himalayas. A well known tree remarkable for its very tall, narrow, erect habit of growth. Used by landscape gardeners to give variety to clumps of other trees, a specimen or clump behind a group of round-topped trees serving "to break up the sky line," but it must not be used too freely. The trees on the Station grounds at Brookings show many dead branches and are not long lived.

Populus tremuloides, Michx. American Aspen, Quaking Aspen. Native of North America, north of Pennsyl-

vania and Kentucky, extending to Mexico and the mountains. A small, handsome tree with whitish gray smooth bark, leaves soft green with whitish veins above, and bluish green beneath. Trees from Wisconsin proved hardy and have done better in closely planted groves on dry land than cottonwood. In its native haunts this is comparatively a short-lived tree.

Potentilla fruticosa, Linn. Shrubby Cinquefoil or Five-finger. This shrub is somewhat cosmopolitan, being a native of northern North America, central Europe and Siberia. A low, much-branched bush three feet in height with grayish-green silky compound leaves. The bright yellow flowers appear all summer, beginning the last of May. Prof. Williams found it abundant along the sides of canons in the Black Hills. A useful shrub for large collections, but not especially desirable for small ones.

Prunus Americana, Marsh. Wild Plum. Native in eastern United States from New Jersey and New York south to Florida, west to the eastern slopes of the mountains of Colorado, New Mexico and northern Mexico. The native plum of South Dakota. Four plants received from Arnold Arboretum and planted in the spring of 1899 are only two and one-half feet high and kill back every winter. It is evident that these four are not northwestern forms of the species as we have many varieties of choice wild plums from Wisconsin, Iowa, Minnesota and Manitoba on the Station grounds that are perfectly hardy. Our wild plums form a good fruit-bearing windbreak, and are not without value for ornament. Every prairie farmer can grow such a hedge with much profit and pleasure, and plum trees scattered in among other trees in a grove fruit better than those in open exposure. To grow seedlings, treat pits the same as Russian Oleaster (Elæagnus) seed, being careful never to let the pits dry out too much, and plant as early in spring as possible.

Professor Sargent writes in his magnificent work, The Silva of North America: "As an ornamental plant, *Prunus*

Americana has real value; the long wand-like branches form a graceful head, which is handsome in winter, and in the spring is covered with masses of pure white flowers, followed by ample bright foliage and abundant showy fruit."

Prunus Armeniaca, Linn. Common Apricot. Native of Turkestan and Mongolia, according to one author; by others regarded as Chinese, but it reached Europe at an early date. The common Apricots are not hardy in this state; a few Russian Apricots have been raised at Yankton, the general complaint appears to be their premature blossoming. A variety secured by the writer from Vernoe, northern Turkestan, for the United States Department of Agriculture, kills back severely. The Japanese Apricot, (*P. Mume*, Sieb. and Zucc.), from Arnold Arboretum, winter-killed.

Prunus avium, Linn. Sweet Cherry, Mazzard. Native of Europe and western Asia. The sweet cherries are descended from this species, tender and worthless in this state. This does not give encouragement to the trial of the ornamental varieties of the same species. Cherry trees on Mazzard roots, root-killed at this Station.

Prunus Besseyi, Bailey. Eight plants received from Arnold Arboretum and planted spring of 1899 are now three feet high and are full of fruit this year. This is the western Sand Cherry found native from Kansas to Manitoba and west to Utah and Colorado. We have grown many thousand seedlings of this species, as received from northern Nebraska and various parts of the Dakotas, with a view to improving the fruit in size and quality, and the results, so far, give us reason to believe that we will soon have varieties worthy of general cultivation. Meanwhile the plant is very worthy of cultivation as an ornamental shrub. The "Improved Rocky Mountain Cherries" are Colorado seedlings of this species. Plants received from Valentine, Nebraska, near the South Dakota line, and set spring of 1897 in a row three to four feet apart now form a hedge four feet high, nine feet across and twenty-five feet long. The abundant

white blossoms appear in early May, and are followed by black fruit about one-half inch in diameter, ripening late in July to early in August. None of these are, however, equal in quality to our second generation seedling from the same source, some of which bore fruit for the first time this year, the seed having been saved from the best of 5,000 seedlings fruited on the Station grounds in 1898 and planted in spring 1899. The handsome glossy foliage and white flowers give this plant decided value as an ornamental shrub and for this can be planted in hedge row or among other shrubs, but for the purpose of raising the largest amount of fruit, it would probably be best to set the plants further apart, four by six feet. At present one of our main lines of work is the improving of our native Sand Cherry. The many points of difference from the eastern form would seem to entitle it to specific rank, *P. Besseyi.* Bailey's Cyclopedia refers it to *P. pumila*, var., *Besseyi*, Waugh, with the statement: "In its extreme form this plant looks to be distinct, but it seems to intergrade imperceptibly into *P. pumila.*"

Prunus Cerasus, Linn. Sour, Pie or Morello Cherry. Native to Asia Minor and probably to southeastern Europe. Nearly the entire Cherry orchard of many varieties at this Station froze out, most of it root and branch, in the winter of 1898-99. This has not encouraged us to test the strictly ornamental varieties. Cherries are not at all on the fruit list of the Minnesota State Horticultural Society; nor on the list of the South Dakota State Horticultural Society, except for the southern part of the state.

Prunus cerasifera, Ehrh. (*P. Myrobalana*, Linn.) Native of southeastern Europe, the Orient, Transcaucasia, Turkestan and southwest Siberia. The Myrobalan or Cherry Plum is extensively used as a stock on which to bud cultivated plums. Myrobalan seedlings planted at this Station for plum stocks in the spring of 1897 nearly all froze out the first winter, the few survivors died during the follow-

ing summer. People in this state who plant hardy native varieties of plums, on Myrobalan or other tender roots, find that their trees root-kill, leaving the hardy top to die. After tens of thousands of dollars have been wasted in this way, planters may find time to investigate the question a little before ordering their trees.

A choice purple-leaved ornamental variety, (*P. cerasifera atropurpurea*, Dipp.; *P. Pissardi*, Hort.,) winter-killed at this Station; also Youngken's Golden Cherry Plum, a variety of this species grown for its early yellow fruit.

Prunus domestica, Linn. Native country unknown, perhaps Transcaucasia, cultivated from the earliest times in west and east Asia and Europe. This includes the west European and Russian plums, none of the varities tested at this Station have proved of value as compared with the best native Americana plums, being either tender or unproductive. This does not encourage the trial of the double-flowered and ornamental-leaved varieties.

Prunus hortulana, Bailey. A group of hybrid plums between *P. Americana* and *P. angustifolia*, found native from Maryland and Virginia to Texas, and represented in cultivation by Wild Goose, Miner, Charles Downing and many others. *P. angustifolia* itself, the Chickasaw plum of the south, wild from Delaware south and west to Missouri and Texas, is tender in this state and the hybrids, so far as tested, are not valuable, except the Miner, which is a favorite market variety in the southeast tier of counties, at Yankton and Vermillion. The Compass cherry, a hybrid of Miner with the western Sand cherry (*P. hortulana Mineri X P. Besseyi*), originated by H. Knudson of Springfield, Minnesota, is very hardy and productive at Brookings and is decidedly ornamental in flower, foliage and fruit; the fruit is about one inch in diameter, good for culinary and very fair for table use, season after the Sand cherry and just before the earliest Americana plums; worthy of cultivation for the home garden.

Prunus Japonica, Thunb. (*Amygdalus pumila*, Sims.) Flowering Almond. Native to central China, Japan and southern Manchuria. These kill back severely at Brookings and should be given winter protection. A Minnesota nurseryman reports good results from budding this and other small ornamental species of Prunus upon *Prunus Besseyi* stocks.

Prunus Maackii, Rupr. Native of Manchuria. An ornamental tree, allied to the European Bird Cherry (*P. Padus*, Linn.), with handsome foliage and racemes of white flowers early in May. Our specimens are four feet high and have not yet blossomed.

Prunus Mahaleb, Linn. Mahaleb Cherry, St. Lucie Cherry. Native of south and south central Europe, the Orient and the Caucasus. The Station cherry orchard, with many of the trees worked on Mahaleb roots, root-killed in the winter of 1898-99. The ornamental varieties we have not tested.

Prunus maritima, Wangenh. Native in North America along the coast from New Brunswick south to Virginia. Of three plants from Arnold Arboretum planted in the spring of 1899, two kill to the ground, and one kills back at tips. The Bassett, a cultivated variety, appears fairly hardy.

Prunus Maximowiczii, Rupr. Native of Japan. A specimen from Arnold Arboretum planted in spring of 1899 is now five feet in height with sharply doubly serrate leaves, and is making a strong, hardy growth. The young shoots are tipped with red.

Prunus nana, Stokes. (*Amygdalus nana*, Linn.) Siberian Almond, Russian Almond. Native of lower Austria, eastward through central and southern Russia, the Caucasus, Siberia, Dahuria and Sungaria. A low bush three feet in height, of neat, compact habit. The abundant pink blossoms nearly an inch across appear very early, this year by the first of May. A very hardy, choice and desirable

dwarf shrub. Our plants were obtained in St. Petersburg, Russia, for the United States Department of Agriculture (S. P. I. No. 236) and are fruiting this year. In time we hope to produce a desirable almond from this species. At present the plant is of value only as an ornamental shrub.

Prunus nigra, Aiton. An early blooming form of the native plum of the northwest, found from Newfoundland to Assinaboia, also in New England and the northern Mississippi valley. In Bailey's Cyclopedia this is referred to *P. Americana* var., *nigra*, Waugh. Represented in cultivation by the Cheney from Wisconsin, and Aitkin from Lake Itasca in Minnesota, and other choice plums.

Prunus Pennsylvanica, Linn. Wild Pin, Bird or Pigeon Cherry. Native from Newfoundland to British Columbia south to Colorado and North Carolina. In this state reported from the Black Hills. Specimens from Manitoba and North Dakota are hardy at this Station. The blossoms, foliage and red bark are ornamental; the tree sprouts considerably. Professor Sargent considers it to be "a handsome, shapely, though short-lived tree, which in early spring is conspicuous for the great quantity of flowers which cover its branches." The light cherry red fruit is the size of a pea. The tree may prove valuable for plant-breeding as the fruit varies in size and is nearer in quality to the cultivated sour cherry than any other of our native cherries.

Prunus Persica, Sieb. and Zucc. Peach. Supposed to be native to China. A few specimens of peaches have been raised in the southern edge of the state, but they are "scarcer than hen's teeth," and financially it is useless to attempt their cultivation. At this Station we have been unable to get the covering thick enough to prevent winter-killing. Trees budded on western Sand Cherry (*Prunus Besseyi*) roots, and grown in boxes which are put in cellar over winter, bore some good peaches this season. This is the first fruit raised on this stock, as far as I know. The trees are dwarfed

very much and when in bloom are a mass of blossoms. The many double-flowered and ornamental varieties we have not felt encouraged to give a trial.

Prunus pumila, Linn. Sand Cherry, Dwarf Cherry. Native of North America from New Brunswick south to Virginia, west to Minnesota and Kansas. Six specimens marked "from near Lake Michigan" received from Arnold Arboretum and planted in the spring of 1899, are now four to six feet high and some are bearing fruit, but the plants winter-kill severely. Five plants marked "New England variety" are three feet high and hardy, are bearing fruit this year but it is small and very inferior. For South Dakota it is evident that the western Sand Cherry is more desirable than the eastern Sand Cherry.

Prunus serotina, Ehrh. Wild Black Cherry. Native from Nova Scotia to Dakota, south to Florida and Texas. In this state it is rare, in the Minnesota and Sioux valleys. Prof. Sargent says it is "one of the stateliest and most beautiful trees of the eastern woods." Its white flowers, shining leaves and racemes of purple black bitterish fruit the size of a pea, make it a desirable ornamental tree. In the Station forestry plantations this tree has proven hardy and desirable, especially in a mixture with Ash, European White Birch and White Elm. In open exposure specimens from Pennsylvania killed back severely in the winter of 1898 and 1899 and the trees became black-hearted.

Prunus tomentosa, Thunb. Native of northern China and Manchuria. A specimen from Arnold Arboretum planted spring of 1899 has proven hardy and is now four feet in height. A shrub of neat habit with shoots thickly set with pubescent leaves. This year the large crop of pinkish blossoms appeared early in May. At Kuldja, in western China the writer saw this species in cultivation in fall of 1897 and the red cherry-like fruit was said to be edible and desirable. The fruit as sampled in the botanic gardens in Hamburg, Germany, early in July of the same year was too small to be of much

value. It may prove of value in plant-breeding work and its distinct foliage and dense habit make it worthy of a place among small ornamental trees.

Prunus triflora, Roxbg. Japanese Plum. Probably native of China, but introduced into the United States from Japan in 1870. Several varieties have been tested at this Station; the Burbank, top-grafted on DeSoto, a native variety, fruited in 1898, but froze out the following winter. This is the general experience in Minnesota and Dakota with Japanese plums.

Ptelea trifoliata, Linn. Hop Tree. Wafer Ash. Native of the eastern states from New York to Florida, westward to Wisconsin and Minnesota. As received from a nursery in Germany this forms a bush six feet high with handsome glossy leaves with three leaflets. Our plants kill back about one-half every winter and are probably of eastern origin. Possibly the Minnesota form of this species would do better.

Prunus triloba flore plena, Hort. Native in eastern and central Asia. A double flowered plum. Of five specimens from Arnold Arboretum planted spring of 1899, four winter-killed, but one is alive. It is now three feet high, but killed back severely.

Prunus Virginiana, Linn. Choke Cherry. Native and common over northern North America to the Arctic circle and occurring in the mountains of Mexico. In South Dakota, common along streams and lakes throughout the state. This tree is quite common upon South Dakota lawns, and even as street trees, being transplanted from the nearest riverbank, but the numerous suckers from the root are objectionable. However its perfect hardiness and willingness to grow commends it to many who have failed with eastern and southern trees. The western Choke Cherry var. *demissa*, Torr. (*P. demissa*, Walp.), is native along streams from Missouri valley westward. As received from near Pierre, is hardy at this Station; the fruit averages of better quality than the common Choke Cherry and the fruit is popular for culinary use.

Prunus Watsoni, Sarg. Sand Plum. Referred to *P. angustifolia*, var. *Watsoni*, Waugh in Bailey's Cyclopedia. Native of dry regions of Nebraska, Kansas and Oklahoma, and prized by the settlers for food. Of four plants from Arnold Arboretum planted in the spring of 1899, all kill back severely every winter; one is now five feet high and bearing fruit this year. One plant marked "early variety," winter-killed. It is evident that the Sand Plum is not as promising as the western Sand Cherry for South Dakota.

Pyrus baccata, Linn. Siberian Crab. Native of eastern Sibera to Manchuria, China and the Himalaya region. Many varieties of the true Siberian crab (those with deciduous calyx) are being tested at this Station. All have considerable claim to be considered ornamental trees, but their main usefulness will probably be as a hardy stock for cultivated apples. The question of root-killing of apple trees is considered in Bulletin No. 65 of this Station. In Russia Pyrus baccata is used as a stock to obviate root-killing.

Pyrus Balansæ, Decaisne. Native of central to southern Europe, Asia Minor, Caucasus, north Persia, west Siberia. A hardy pear tree of neat, erect growth and small glossy leaves. Present height seven feet. Koehne refers this to *P. communis* and states that our cultivated pears arose from crosses of this species with *P. nivalis*, Jacquin and perhaps with *P. Persica*, Persoon.

Pyrus betulifolia, Bge. Native of north China. A small-leaved, hardy tree, nine feet in height. The young leaves and shoots thickly covered with gray pubescence, the olden leaves glossy green on both sides, paler beneath. This tree is a near relative of the pear and shows no blight so far. An ornamental tree only, the brown fruit being the size of a pea. Our plants have not yet fruited.

Pyrus communis, Linn. Common Pear. Native of central and southern Europe, and western Asia. The standard varieties of the Pear of the eastern states both winter-kill and blight in the northwest; several Russian varieties proved

hardy at this Station for ten years, but finally all perished from blight. This does not encourage the trial of the ornamental-leaved varieties of the Pear, several of which are offered in European catalogues.

Pyrus floribunda, Scheideckeri, Hort. A hybrid (*floribunda* X *prunifolia*,) according to Koehne. Of two specimens, one winter-killed and one kills to the ground.

Pyrus Ioensis, Bailey. Western Crab Apple. Native of the Mississippi valley. In 1896 seedlings of this species were grown at this Station from seed gathered near Des Moines, Iowa, but these winter-killed the first winter (see Bul. No. 65). It is not found native in South Dakota except, perhaps, in the southeast corner. A cultivated variety from Illinois, Bechtel's double-flowered crab, is reported hardy at Yankton and is considered valuable for ornament where hardy. Several large-fruited sports or hybrids (*P. Soulardi*, Bailey) and considered to be natural hybrids of *P. Malus* and *P. Ioensis*, appear hardy. They were top-grafted in the old Station orchard in the spring of 1897 and have fruited the last two years.

Pyrus, species Kashmere. From Turkestan. A hardy small-leaved apple tree or bush, from Arnold Arboretum; now three feet in height.

Pyrus Malus Niedzwetzkyana, Dck. Native of the Caucasus, the Kashgar region, Turkestan. Found by Niedzwetzky near Vernoe, capital of the Semiretchinsk province of northern Turkestan, in the mountains separating Russian Turkestan from western China, and by him sent to the German dendrologist, Dr. Dieck. The writer met the former gentleman in Turkestan in fall of 1897 and also found similar varieties of red-fleshed apples in Turkestan and western China, especially north of Kashgar. The plant is remarkable for the more or less of red coloring (erythropism) of young wood, cambium, bark, young leaves, flowers, fruit and flesh. Its habitat does not give promise of perfect hardiness, but it is interesting as a curiosity. Our first importation

from Germany was lost by the root-killing of the stock; later plantings are more promising.

Pyrus Miyabei, Sargent. Choke Berry, (*Micromeles alnifolia*, Koehne; *Sorbus alnifolia*, K. Koch.). A specimen, from Arnold Arboretum, of this Japanese and southern Manchurian tree planted in the spring of 1899, is hardy so far, and forms a neat, handsome small bush with small alder-like leaves.

Pyrus nigra, Sargent. Native of North America, from Canada south to Florida, westward to Montana, Minnesota and Illinois. Dippel refers this to *Aronia nigra*, Dippel. A hardy low spreading bush, two and one-half feet in height, of neat habit and with obovate to oval somewhat glossy leaves. A promising ornamental shrub.

Pyrus prunifolia, Willd. Native of China and Japan, according to Dippel; and Siberia and north China, according to Koehne. This includes a large number of "hybrids" or Siberian Crabs with persistent calyx (the "blossom end" remains attached to the ripe fruit). The Transcendent and Hyslop crabs are good examples. Many varieties are being tested at this Station, some of them, such as the two just named, are very subject to blight; others, such as the Martha Crab, are quite ornamental in tree, flower and fruit and are not subject to blight. Some authors consider *Pyrus prunifolia* to be a good species, others regard it as a hybrid group, *Malus* X *baccata*, intermediate between the cultivated apple and the true Siberian Crab. This would make *P. prunifolia* hold a similar relation to the apple that *Prunus hortulana* does to the native plum, it being an intermediate group between the southern *angustifolia* and the northern *Americana*.

Pyrus Ringo, Wenzig. Native of Japan. A small tree of spreading bushy habit, ten feet in height. The rose colored flowers in May are succeeded by small roundish fruits from one-half to three-fourths of an inch in diameter. Our specimens root-killed, so hardiness is uncertain.

Pyrus Sinensis, Lindl. Japanese and Chinese Pear. Native of Manchuria, the Corean archipelago, China and Japan. As received from the Arnold Arboretum in the spring of 1899, one tree winter-killed (perhaps by cellaring during the first winter followed by drouth after transplanting the next spring,) but one specimen tree marked "Var. No. 1, C. S. Sargent," is a strong growing tree six feet in height with sharply toothed dark green glossy leaves, pubescent young shoots, and spreading branches.

Pyrus Toringo, Sieb. Toringo or Dwarf Crab. Native of Japan. As imported by Prof. Budd, this forms a large fairly hardy shrub six to eight feet in height with small pink to white blossoms and fruit the size of a large pea. The calyx is deciduous. The leaves are very variable ranging from ovate apple-like leaves to leaves lobel like those of the hawthorn. This species is being tested as a dwarf stock for the apple. Five trees of Duchess and Wealthy budded on *P. Torugo* in the fall of 1896, are now four to five feet in height but have not fruited. They were transplanted last spring. Many young trees of P. Toringo root-killed in the winter of 1898–99. As received from Arnold Arboretum some, marked "Hillside variety" and *Pyrus Toringo atrosanguinea*, winter-killed, while others, marked P. Toringo and P. Toringo No. 2, appear hardy.

Rhamnus cathartica, Linn. Buckthorn. Native of Europe, Siberia, western and northern Asia. One of the best plants for ornamental hedges. The ovate dark green leaves are attractive throughout the season; flowers small and inconspicuous, branches thorny. The black fruits are the size of a pea. A hedge ten rods long started on the Station grounds from small seedlings in the spring of 1896, has proven perfectly hardy. It was dwarfed at first by a hedge of Golden Currant, in adjoining row but is now nine feet high and very dense. On Geo. H. Whiting's grounds at Yankton, there is a fine Buckthorn hedge which is kept trimmed square on top. John H. Miller, of Huron, has a fine Buckthorn hedge which

is shown in Plate No. 12. Under date of August 22, 1899, Mr. Miller writes:

Complying with your request of the 15th inst., regarding a history of my Buckthorn hedge, would say that I first set the hedge from two-year old seedlings about ten or twelve years ago, its size now as it is trimmed, shown in the photograph, is six feet high, four feet wide and about fifty feet long, it is very thick and clo se so that a robin cannot (not directly) fly through it. I have kept it trimmed back every year, otherwise it would have grown twenty or more feet high, it is a rapid grower and after the first two years from setting is as hardy as an oak. The coldest weather does not affect it or kill it back a particle. Will also stand hot dry weather as well as cold. It is the best substantial hedge for all climates and purposes that I know of, and I have tried and am acquainted with several other varieties of hedge plants and have found none equal to this. It will not grow from cuttings, is propagated from seeds which ripen in the fall.

Yours truly,

JOHN H. MILLER.

Rhododendron. The cultivated Rhododendrons of eastern nurseries are conspicuous by their absence from northwestern nursery catalogues, owing to entire lack of hardiness.

Ribes aureum, Pursh. Golden Currant, Missouri currant. A native of South Dakota and other states along the Missouri westward to the Rocky mountains. This is one of the best hardy shrubs for the lawn and ornamental screens. The abundant bright yellow blossoms appear nearly through May and are noteworthy for their spicy fragrance. The fruit is usually black but bushes with yellow fruit are sometimes found. This fruit is edible, but mostly small. The Crandall is a cultivated variety which has proved hardy and fruitful at this Station. We are raising thousands of seedlings of the Golden Currant with a view to increasing the size of the fruit.

Ribes Diacantha, Pallas. (*R. saxatile.* Pallas.) Native of Siberia, from Altai to the Amur region; Sungaria, Manchuria. (S. P. I., No. 321, of United States Department of Agriculture.) A hardy somewhat thorny shrub, four feet in height, not yet fruited.

Ribes floridum, L'Herit. (*R. Americanum*, Mill.) Wild Black Currant. Native to Canada and New England,

south to Virginia, west to Dakota. In this state very common along streams east of the Missouri river. This plant is considered worthy of a good place in ornamental shrub collections in European gardens and should receive equal consideration at home. The long racemes of yellowish white blossoms are followed by black fruit much liked for jelly. In a plantation of 2,200 plants on the Station grounds, raised from selected fruit in the hope of originating improved varieties, some plants have a handsome red brown foliage in the fall. This species is both useful and ornamental.

Robinia hispida, Linn. Rose Acacia. Native in the mountains of southern United States from Virginia and North Carolina to Georgia. Not in the Station collection; reported hardy at Mitchell and Yankton.

Robinia Pseudacacia, Linn. Black Locust. False Acacia. Common Locust. Native from southern Pennsylvania to Indiana, Iowa and southward. Not native in South Dakota. Prof. Green reports it "too tender for general planting in Minnesota, but in favorable locations it makes a desirable lawn tree on account of its pretty foliage and white flowers." The Black Locust was planted in the early years of the Station, but is not now in the collection. Reported hardy at Vermillion. The Black Locust is a striking example of how plants are often more honored abroad than at home. In Europe this is a popular ornamental tree and at least thirty named varieties are in cultivation. One nursery last year offered twenty-three varieties differing in habit, size, foliage, color of blossom and other characteristics.

Roses. The list of roses sufficiently hardy for this state without winter protection is decidedly short. Many varieties of Hybrid Remontant or Hybrid Perpetual roses, have winterkilled at this Station, although given winter protection with earth and mulch. Magna Charta, Crimson Rambler and Dawson also proved tender. The Hybrid Perpetuals must be given very careful winter protection in the larger part of the state. Of yellow roses, the Harrison Yellow is very hardy and a profuse

bloomer through June; a white double variety evidently of the same species (Rosa lueta), name undetermined, obtained in a local garden, is equally hardy. Of climbing roses, the Multiflora with dark red double flowers has proved hardy for a number of years in a private local garden. Queen of the Prairies, with rose red double flowers, stands fairly well with good winter protection. Of double white roses, Madame Plantier is probably the hardiest, at present it is not in the collection.

Of single roses the Siberian, Rosa rugosa is perfectly hardy. Plant breeders have been busy of late years in Europe and America hybridizing this rose with various cultivated double roses.‡ We imported several of these later productions last fall. Two rugosa hybrids imported from Germany and planted in the spring of 1896 at this Station, have proven sufficiently hardy, to blossom freely without winter protection, although not perfectly hardy. One is Madame George Bruant, with semi-double pure white fragrant flowers; the other is Madame Chas. Frederic Worth. This variety produces beautiful, double flowers in terminal clusters all summer beginning about July first. The thick leathery wrinkled leaves show the influence of Rosa rugosa. Plants of this variety secured for Prof. Budd, in Germany in 1894, by the writer have proven hardy and very desirable at the Iowa Experiment Station.

It now appears probable that most of the future hardy double roses for the prairie northwest will have Rosa rugosa as one of its ancestors.

Rosa rugosa, Thunb. Native of north China, Manchuria, Amurland, Kamtschatka, Corea, Sachalin and Japan. A hardy rose of vigorous growth, with strong thorny branches, thick leathery wrinkled glossy foliage, and large crimson fragrant single flowers. Some plants out of a lot grown from seed planted last spring are bearing flowers during this, their first season of growth. The buds of this rose are

‡Bulletin No. 22, 32 and 36, Iowa Experiment Station, J. L. Budd and N. E. Hansen.

long pointed and very handsome. The bush merits a place in clumps of shrubbery on the lawn, and all its hybrids are worth testing in a small way.

Rosa rugosa flore plena, Hort. This is a double variety imported originally from Russia by Prof. J. L. Budd. We have it also from our 1896 importation and from St. Petersburg, Russia, through the United States Department of Agriculture in the spring of 1898. All are perfectly hardy and free bloomers. In blossom by the first of June. The smaller leaves are less glossy and the purplish red flowers are less attractive than those of Rosa rugosa, but the plant is fully worthy of cultivation.

Rosa rugosa Kamtschatica, Vent. Native of Kamtschatka. Blossoms single, dark pink, buds large and thorny. Bush hardy and a free bloomer for about one month, beginning about the last week in May.

Rosa rugosa macrocarpa, Hort. A variety with larger seed pods or hips. In Russia the hips of Rosa rugosa are used for preserves, the seeds being removed and the remaining fleshy portion utilized. In autumn the large scarlet hips appear to much advantage in contrast with the glossy foliage.

Rosa setigera, Mchx. Native of North America from southwestern Canada and Ontario south to South Carolina and Florida, west to Wisconsin, Missouri, Nebraska and Texas. Two plants from Arnold Arboretum planted in 1899 killed to the ground but the young shoots are strong.

Rubus nobilis, Regel. A hybrid raspberry (*Rubus odoratus X Idæus*). Probably originated in England from which country it was first sent out. Of two imported plants planted in the spring of 1899, one winter-killed and the other killed to the ground, but is sprouting up from the roots.

Salix alba, Linn. White Willow. Native throughout Europe, in western and northern Asia and northern Africa. The White Willow is one of the best trees for windbreaks on the prairie. *Salix alba regalis*, the Royal Willow, is an

ornamental variety with leaves covered with silky down, giving it a silvery aspect. This is not in the Station collection, but has proven hardy at the Minnesota Experiment Station.

Salix alba vitellina, variety from Russia, Hort. As imported by Prof. Budd from Russia under the name *Salix aurea* and commonly known as Russian Golden Willow, this is a hardy round-topped tree of very rapid growth, remarkable for its bright yellow bark in winter.

Salix blanda, Anders. A hardy hybrid Willow (*S. Babylonica X fragilis*, Clemenc), of strong growth, rounded top, long slender somewhat drooping branches and long lanceolate leaves.

Salix Caprea pendula, Hort. Kilmarnock Weeping Willow. This graceful weeping tree is very popular wherever it has proven hardy. *Salix Caprea*, Linn., or Goat willow is a native of central and southern Europe and northern Asia. The general experience in the northwest is that the Kilmarnock Weeping Willow is not hardy. A specimen planted in the spring of 1898, killed back severely the first winter and perished the succeeding winter.

Salix laurifolia, Hort. As imported by Prof. Budd and known as Russian Laurel-leaved Willow, this is probably a form of *S. pentandra*, Linn. It is a small, open-topped tree valuable for its handsome foliage, the leaves glossy as if varnished. Native of northern and central Europe and Asia. The two foregoing species are the best for ornamental purposes of the various species of willow well tested at this Station.

Salix Uralensis, Hort. Dippel refers this to *S. purpurea gracilis*, Gren. et Godr. As secured by the writer in Russia for the United States Department of Agriculture, this is a hardy ornamental shrubby willow with very slender purple drooping branches and small narrow leaves. The name refers to the Ural region separating European Russia from Siberia. Spaeth says it is excellent for tying purposes.

Salix viminalis Regelis. Secured by the writer in Russia in 1897, for the United States Department of Agriculture. Very few cuttings grew and we have been propagating it ever since. A hardy strong growing willow noteworthy for its bright yellow bark in winter.

Sambucus Canadensis, Linn. Elderberry. Native from New Brunswick south to Florida, west to Utah. The Speer elderberry is a large-fruited variety, found by R. P. Speer, near Cedar Falls, Iowa. It is a large spreading bush with handsome foliage. It kills back severely every winter; flowers freely on the new growth, but sets little or no fruit. The native form, occurring in the Black Hills and the southeastern corner of the state, merits attention.

Shepherdia argentea, Nutt. Buffalo Berry. A shrub six to eighteen feet in height, native from Manitoba and Minnesota to Saskatchewan and Nevada. In South Dakota it is common in the Missouri valley, rare in the Minnesota valley. The revised name, *Lepargyræa argentea*, (Nutt.) Green awaits acceptance by nurserymen. The Buffalo Berry is a handsome ornamental bush with silvery foliage and red berries. Occasional plants are found with yellow fruit. The plant is diœcious, hence care should be taken, if fruit is desired, to plant both male and female plants. Some groups of Buffalo Berry planted while small some years ago at Brookings, turned out to be all staminate or male plants, hence no fruit is produced. Two of the groups contain some pistillate as well as staminate plants and an abundance of fruit is secured every year. The staminate or male plants may be known in their winter condition by the dense clusters of rounded flower buds; the pistillate or female plants by the smaller, flattened, fewer, more slender flower buds. The fruit varies greatly in size, quality and season and is gathered in large quantities for culinary use. It makes a delicious jelly. Some berries are of sprightly flavor, good for eating out of hand. It can also be dried for winter use. The fruit is generally considered better when touched by frost, less

sugar being required. The name is said to have come from the custom of eating the berries as a sauce with buffalo meat in the early days.* The Buffalo Berry makes a fine thorny hedge, which is both useful and ornamental. We find that sprouts received as dug up in the native thickets from various parts of the northwest do not always transplant satisfactorily; a year in nursery row gives them better roots and secures an even stand when set in their permanent place. Seedlings are better rooted. The writer is raising thousands of seedlings with a view to improve the fruit in size and quality. Seedlings are very easily raised from seed washed free from the pulp in the fall and stratified for winter freezing in sand, in the same manner as described for *Elæagnus angustifolia*, and planted very early in the spring.

Sorbus aucuparia, Linn. European Mountain Ash. Native of Europe, Caucasus and northeast Asia. This tree has proven hardy against winter-cold on the Station grounds for the past ten years, but the stem is very susceptible to sunscald on the south and southwest side, so a number of trees have perished as a consequence. This is a choice ornamental tree owing to the cluster of white flowers in May and abundant red berries in summer and fall, but the stem must be protected from the sun. Some of our trees have the main stem shaded by a few sprouts allowed to grow on the south side; if this is objectionable, burlap may be tacked on or the shade given by bushes.

Sorbus aucuparia fructu dulcis, Hort. This is referred to *S. aucuparia moravica* by Dippel. An edible-fruited variety from Moravia, a province in Austria. A hardy tree of upright habit, now eight or ten feet in height, no fruit so far. In Russia the fruit of the mountain ash is used for cordials and a kind of fruit brick made from compressed fruit pulp.

Sorbus aucuparia pendula, Hort. Weeping Mountain Ash. This tree is a curiosity rather than an object of

*Bush Fruits. F. W. Card, p. 484.

beauty and is as hardy as the common type with the exception that it is even more subject to sunscald. Being grafted five or six feet in height on European Mountain Ash stock, leaves on the tall stem exposed to the sun. The long slender branches hang to the ground and give the tree a peculiar expression.

Sorbus hybrida quercifolia, Hort. Oak-leaved Mountain Ash. A natural hybrid of the White Beam tree and European Mountain Ash (*S. Aria X aucuparia*) from northern Europe. Dippel says it comes true from seed and is a handsome lawn tree of dense pyramidal habit. The leaves are dark green above, downy beneath, deeply lobed at base, sharply toothed toward the apex. The tree appears to be as hardy as the European Mountain Ash and suffers as severely from sunscald.

Spiræa alba, Duroi. An American species, a large spreading bush three feet in height; kills back one-third, but flowers freely on the ends of young shoots. The pinkish white flowers appear in profusion in early July.

Spiræa albiflora, Zabel. Native of Japan. In 1899 this formed a small clump one foot in height, covered with pure white flowers in early July, but it is now dead.

Spiræa arguta, Zabel. According to Dippel this is a hybrid of three species (*S. media X crenata X hypericifolia*) all of which range from eastern or southeastern Europe westward through Mongolia and Siberia. A very choice and hardy shrub, now four and one-half feet in height, forming a dense roundish upright mass of slender branches set with small light green leaves. One of the earliest shrubs to flower on the Station grounds usually beginning the first of May and continuing for four weeks. The blossoms are small, white and thickly set on the slender branches. A good substitute for the "Bridal Wreath" Spirea of the eastern states which is not hardy here.

Spiræa aubifolia, Hort. This is regarded as a dwarfish form of *S. alba latifolia* by Dippel. It kills back every

winter, but is a vigorous grower and a free bloomer through July. Blossoms flesh color changing to white. Dippel gives its nativity as North America and the island of Sachalin.

Spiræa Bethlehemensis, Hort. Referred to *S. alba latifolia* by Dippel. Native of North America and the island of Sachalin. Present height three and one-half feet. Kills back, but flowers freely on ends of young shoots. The bush is of open, sprawling habit and needs pinching to keep it in shape. The dark pink flowers appear in large panicles through July and August.

Spiræa Bethlehemensis rubra, Hort. A bush three feet in height; kills back nearly to the ground, but blossoms freely through July on the tips of the many vigorous young shoots. The rose-pink blossoms are produced in large panicles and are attractive at a time when few shrubs are in bloom.

Spiræa Billardii, Hort. Billard's Spirea. A bush four and one-half feet in height, of neat upright habit. Kills back one-third, but flowers freely every year in late June and through July. The attractive dark pink blossoms appear in large many-branched panicles on the tips of the young shoots. Desirable.

Spiræa Billardii longipaniculata, Hort. Billard's Spirea. A hybrid variety in bloom the last of June and July. This shrub is sufficiently hardy, killing back a little at the tips. The long much-branched panicles of bright rose colored blossoms are attractive.

Spiræa cinerea superhypericifolia, Zabel. A hybrid. Height two and one-half feet, killing back every winter, but forming a very neat dense mass of foliage; blossoms white in late May.

Spiræa conferta, Zabel. A hybrid (*S. cana X crenata*). A bush three feet in height, forming a broad clump of graceful foliage and slender branches. Blossoms white in early June. Bush hardy and very attractive, but not a free bloomer.

Spiræa Douglasii, Hook. Native of British Columbia, Oregon and northern California. Bush four feet in height, kills back a little but is a very free bloomer in July and August. The rose pink blossoms are in panicles on the ends of the young shoots. A choice shrub worthy of cultivation owing to its late blossoming.

Spiræa eximea, Booth. A hybrid (*S. Douglasii X salicifolia*). A bush four feet in height, kills back nearly to the ground, but flowers freely on the numerous strong young shoots. Blossoms are rose colored in panicles and appear all summer, beginning about July first. Flowers are not large, but attractive.

Spiræa Fortunei semperflorens, Hort. A hybrid (*S. Japonica X salicifolia*). Dippel classes this as *S. semperflorens.* Bush four and one-half feet high with pink flowers on ends of young shoots. In severe winters this shrub kills back too much to be valuable. The blossoms appear early in July and continue till frost.

Spiræa hypericifolia, Linn. Native of southern Russia and southeast Europe, across the Ural mountains to eastern Siberia and Mongolia, also the Orient and Caucasus to Turkestan. A hardy shrub four feet in height. The very abundant, handsome white flowers appear during May and early June.

Spiræa hypericifolia thalictroides, Hort. Native of Siberia and Dahuria. A bush two and one-half feet in height, forming a dense mass of slender shoots and small leaves. A fairly hardy dwarf bush of graceful habit. The white blossoms appear in late May and early June.

Spiræa lævigata, Linn. Dippel referrs this to *Sibiræa lævigata,* Maxim. A native of Siberia, especially of the Altai and Thian-schan mountains. Many specimens imported direct from Russia as well as from a nursery in Germany have proved very hardy. It is very early in leafing out in the spring being in full foliage the first of May. The large terminal panicles of white flowers appear in late May and

early June. The branches are erect, rigid, red-brown. Leaves three inches long, somewhat glossy, of a peculiar blue-green color. Worthy of propagation.

Spiræa Lenneana, Hort. A hybrid (*S. Douglasii X latifolia*). A bush three feet in height, of strong spreading habit. Kills back one-third but produces numerous strong shoots tipped with large and uneven panicles of pink flowers during July and August. Desirable and sufficiently hardy.

Spiræa Margaritæ, Zabel. A hybrid (*S. Japonica X superba*). This forms a low shrub, eighteen inches in height, killing to the ground nearly every winter, but flowering freely in July and August on ends of the young shoots. The pretty pink flowers are useful for bouquets. A plant worthy of winter protection.

Spiræa notha, Zabel. A hybrid (*S. alba X corymbosa*) dwarf bush two feet in height, killing nearly to the ground in winter, but producing an abundance of pretty pink flowers on the ends of the young shoots from the first of July until frost.

Spiræa opulifolia, Linn. Nine-bark. Dippel gives preference to the name *Physocarpus opulifolia*, Rafin. A native of North America, ranging from Canada to Florida and westward to the Pacific slope. Our specimen was imported from Germany and kills back severely in the winter; it is probably not the form found native in this state. The attractive white blossoms the latter part of June are followed by inflated red capsules.

Spiræa opulifolia lutea, Hort. Golden-leaved Nine-bark. This is a variety of the above species with golden yellow leaves changing to bronze as they become older. Kills back considerably but is worthy of cultivation, owing to its bright colored foliage in the spring.

Spiræa oxyodon, Zabel. Hardy and a profuse bloomer, the last half of May; flowers white, attractive. A hybrid (*S. flexuosa X media*). Height five feet, of strong growth.

Spiræa pachystachys, Hort. This is a hybrid (*Douglasii*

X Japonica callosa). Height one and one-half feet. Kills nearly to the ground every winter, but flowers freely on tips of young shoots in late June and July. Blossoms dark pink, pretty, but bush is too dwarf to make it of value, except possible for low borders or in front of larger bushes.

Spiræa salicifolia, Linn. Native of east Europe, north Asia and North America. Height two and one-half feet. As received from Germany, this bush kills back nearly to the ground and is too tender to be of value. The pink flowers appear during July.

Spiræa Schinabecki, Zabel. (*S. Chamaedryfolia X trilobata*). A hybrid variety with white flowers. Killed back one-half. Height two and one-half feet. The pretty white blossoms appear during June. Too tender.

Spiræa tomentosa, Linn. Native of North America, from Canada south to Georgia, west to Minnesota and Kansas. As received from Germany, kills to the ground every winter and is of no value.

Spiræa Van Houttei, Briot. Van Houtte's Spirea. A hybrid (*S. cantoniensis X trilobata*). The former is a native of China and Japan; the latter ranges from Turkestan and southern Siberia to Sungoria and north China. Originated in France, by Billard. Height four feet, forming a dense mass of foliage. A profuse bloomer in late May and early June. The white flowers are thickly set along the slender branches. All things considered, it is the most beautiful of all the Spireas and should be among the first of all ornamental shrubs chosen for the lawn. It sometimes kills at the tips but not enough to prevent its free flowering every year on the college grounds for the past ten or twelve years. It is doing well in Manitoba and North Dakota. I find that the bush is easily propagated by planting cuttings out in the fall the same as currant cuttings, and also by dividing old bushes in early spring.

Symphoricarpus racemosus, Mchx. Snowberry. Native of Canada and the northern United States. In South

Dakota it is found along streams and on dry banks throughout the state. A favorite in old gardens; the small pink flowers are followed by large white berries which hang on the plant through part of the winter. At the Experiment Station, at Indian Head, Assiniboia, Canada, it has been found desirable for dwarf hedges and borders as it endures very severe trimming.

Syringa Amurensis, Rupr. Amur Lilac. Native of Manchuria and the Amur river region of Siberia. A hardy bush six feet in height with large glossy leaves and white fragrant flowers the last half of June. Habit not compact; probably trimming is needed to keep it in shape. Worthy of cultivation.

Syringa Japonica, Dcne. Native of northern Japan and the island of Nippon. Of three specimens from Arnold Arboretum, planted in the spring of 1899, one winter-killed, the others are two and one-half feet in height but kill back too much. They resemble *S. villosa*, but are not nearly as hardy. Another specimen planted in the spring of 1897, worked on common lilac, has produced a few large panicles of delicate white fragrant flowers, but the stock is strongly inclined to sprout.

Syringa Pekinensis, Rupr. Native of northern China. This specimen planted in the spring of 1899, received from Arnold Arboretum, has made a strong hardy growth of five feet with attractive glossy leaves and white flowers in May and June.

Syringa Persica, Linn. Persian lilac. Native of eastern Caucasus, Persia and the Orient. This bush is a very free bloomer in late May and early June; the small leaves distinguish it from the common lilac. A hardy shrub worthy of general cultivation.

Syringa Rothomagensis rubra, Lodd. This is referred to *S. dubia* by Dippel. Sometimes called Chinese lilac. Origins not definitely known. A hardy bush five and one-half feet in height, leaves small. The bush appears

hardy, but the flower buds are too tender to give many blossoms.

Syringa villosa, Vahl. Native of northern China and Mongolia. Three specimens planted in the spring of 1899, received from Arnold Arboretum, are now four feet in height. The large somewhat glossy leaves, and the nearly white and light purple, fragrant blossoms in early May and the first three weeks in June, make it very distinct and ornamental. Bush not perfectly hardy but sufficiently so to give it place in the list of desirable shrubs.

Syringa vulgaris, Linn. Lilac. Native of central Europe and the Orient. Under cultivation the lilac of old-fashioned gardens has varied greatly and a very large number of varieties are now in cultivation. One eastern nursery offers about sixty varieties. Dippel divides them into five groups according to the flowers: 1, Purple; 2, Light colored; 3, Blue; 4, White; 5, Double. The variegated-leaved varieties are mentioned as undesirable and not constant, generally reverting to the green-leaved type. Of the single varieties, the following have been tested at this Station: Alba grandiflora, alba pyramidalis, Andenken an Ludwig Spaeth, aurea, Doktor Lindley, Doktor Nobbe; Eckenholm, Frau Bertha Dammann, Geant des Batailles, Goliath, Justi, Lovaniensis, Madame Briot, Madame Moser, Princesse Marie, Prinze Notger, rubra Trianoniensis, Schneelawine, Siberica. Of the double-flowered varieties (*Syringa vulgaris fl. pl.*): Leon Simoni, Mathieu de Dombasle, Michel Buchner, Renoncule, Tournefort.

All of these have proved hardy. Many are grafted on ordinary lilac stocks which are strongly inclined to sprout, thus giving two kinds of flowers in the clump, but the sprouts rob the grafted variety if not removed. Sometimes these lilacs are worked on privet stocks (*Ligustrum,*) but such would be liable to root-killing here. Of the sorts named above, the following have done especially well: Andenken an Ludwig Spæth, Frau Bertha Dammann,

Goliath, Madame Moser, Schneelawine, Mathieu de Dombasle, Michel Buchner, Renoncule. But choosing a list is largely a matter of individual taste, and after all the old fashioned lilac with bluish-purple fragrant flowers in late May and early June, the parent of the improved sorts, is still very worthy of a place on every lawn.

Tamarix Amurensis, Hort. Amur Tamarix. This beautiful shrub was imported by Prof. Budd, from Russia. This name is not given by Dippel or Koehne nor was the name found at the St. Petersburg Botanic Gardens in 1897, by the writer. It is a nursery name under which it has become widely known in the west and needs be retained for the present. This shrub has done well for the past ten years on the Station grounds on the south side of the Main building. Although killing back nearly or quite to the ground every winter, it sprouts vigorously every spring. The slender graceful shoots with silvery cedar-like foliage give it a unique appearance. The small spikes of pink blossoms are in long panicles and appear in July on the tips of the young growth. The plant is easily propagated by cuttings planted in the fall. We find that young plants should be mulched the first few winters until well established; further south the shrub should be pruned severely every spring to give an abundance of young shoots which constitute its chief beauty.

Tilia Americana, Linn. Basswood, American Linden. Native from New Brunswick, west to Assiniboia, south to Georgia and Texas. A handsome hardy tree for the street and lawn but is subject to severe injury from sunscald. The trees at Brookings proved short-lived for this reason, only a few sprouts remaining. The stem may be protected by hay bands or burlap. Prof. Green gives the Minnesota experience as follows: "Newly transplanted street trees of this species are liable to injury from sunscald in this section until they are well established and for this reason should have their trunks protected from the sun for several years after they are set out."

Ulmus Americana, Linn. White Elm, American Elm, Water Elm. Native from Newfoundland to the Rocky mountains, south to Florida and Texas. In South Dakota it is found along lakes and streams throughout the state. This is probably the best street, park and lawn tree for general planting. At Brookings it has made a good growth both in the timber plantations and in open exposure. Some white elms from New York have not done as well as native South Dakota trees.

Ulmus effusa, Willd. Native of north and central Europe and northern Orient. A hardy elm now seven feet in height. Dippel gives preference to the name *U. pedunculata*, Fong.

Ulmus Montana, With. Mountain Elm. Referred to *U. scabra*, Mill., by Dippel. Native of central Europe, England, Sweden; and of Asia to the Amur region. Our four trees planted in 1897, have proven hardy. A hardy species of elm with large leaves.

Viburnum cassinoides, Linn. Withe rod. Appalachian Tea. Native of eastern North America, from Newfoundland to the Saskatchewan and from New England to New Jersey and Pennsylvania. Of three specimens from Arnold Arboretum, one winter-killed and the others are alive, from one to two feet but killed nearly to the ground.

Viburnum cotinifolium, Don. Native of Nepal. Bush two and one-half feet in height, rough hairy gray-green leaves. Of four specimens, two winter-killed and the others are alive but kill at tips. Distinct and ornamental.

Viburnum dentatum, Linn. Native from New Brunswich to Michigan and south to Georgia. Of five specimens from Arnold Arboretum planted in the spring of 1899, two winter-killed; three are now one and one-half feet high but kill back one-half.

Viburnum Lentago, Linn. Nanny-berry, Sheep-berry, Sweet Viburnum, Black Thorn. Native in rich soil from Hudson Bay to Manitoba, south to Georgia, Indiana and

Missouri. Native in South Dakota, in the Minnesota and Sioux valleys and the Black Hills. As received from Manitoba this has not yet fruited but is a handsome hardy shrub with long gray sharp-pointed buds. The fruit is sweet and edible.

Viburnum opulus, Linn. High Bush Cranberry. Native throughout Europe; in northern Asia and Siberia; and in low grounds from New Brunswick to British Columbia south to New Jersey, Michigan and Oregon. In South Dakota, in the Minnesota valley and in the Black Hills. A handsome shrub with white flowers; the red berries are used in the Dakotas and Manitoba for jelly and sauce. The plant varies in hardiness. Of five specimens from Arnold Arboretum in spring of 1899, three winter-killed and two are alive, but kill back severely. As received from Cavalier, North Dakota, hardy at this Station. A plant worthy of attention, being both useful and ornamental.

Viburnum opulus sterile, Hort. Snowball. A sterile-flowered form of the preceding. The old-fashioned Snowball still retains its popularity. At Brookings it is hardy, but should be watered in dry falls before winter sets in.

Vitis Amurensis, Rupr. Amur Grape. Native in northeastern Asia, including Mongolia, Manchuria and north China. Small plants of this wild grape planted in the spring of 1898 have proved hardy without winter protection. Transplanting since has not given them opportunity to fruit.

Vitis Labrusca, Linn. Fox Grape. Native of the eastern United States, from New England southwards in the Alleghany region and highlands to west central Georgia. The parent of most of the cultivated American grapes. Sometimes used for arbors, but none of the many sorts tested at this Station, including Concord and its seedlings and hybrids, with the Old World wine grape (*Vitis vinifera*, Linn ,) have proved hardy even when laid down in autumn and covered with earth for winter protection. Some grapes

are raised in the southern part of the state. For the northern part, plant the native wild grape for the present

Vitis vulpina, Linn. (*Vitis riparia*, Mchx.) Native from New Brunswick to Manitoba, the Dakotas, Kansas and Colorado, south to West Virginia, Missouri and Texas. None of the cultivated varieties and hybrids of this species, so far as tested at this Station, have proved hardy, the parent being of the eastern and southern forms. Thousands of seedlings are being raised at this Station of the northwestern form, as found in the Dakotas and Manitoba, Minnesota and northwest Iowa; this spring 5,000 plants were set in vineyard for fruiting, the hope being to improve the fruit in size and quality. For ornamental purposes the wild grape has decided value. Arbors can be quickly covered with a few vines. If fruit is desired, either bearing vines should be taken, or plants grown from cuttings or layers taken from a bearing vine. This is because bearing vines have perfect flowers, containing both stamens and pistils, while all the other vines bear staminate or male blossoms only. But even if the young vines dug at random turn out to be staminate vines they will be desirable, the blossoms being very fragrant.

Wisteria Chinensis, DC. Chinese Wisteria. Referred to *W. Polystachya*, K. Koch, by Dippel and Koehne. Native of China and Mongolia. This favorite climbing vine is reported half-hardy at Mitchell and Yankton. Not usually considered very hardy.

EVERGREENS.

A full discussion of evergreens is reserved for a future bulletin. At this time, for the sake of completeness, a brief list gained from discussions at the last three annual meetings of the South Dakota State Horticultural Society,‡ from notes from correspondents, and from experience at this Station, will be of service to the prairie planter.

What Not to Plant. The following have proven

‡ Reported by the writer as Secretary.

more or less undesirable for general planting in this state, either from lack of hardiness or ability to endure open exposure: White Pine, Red Pine, Norway Spruce, Engelmann Spruce, Arborvitæ or White Cedar, Hemlock, Balsam Fir, Black Spruce, southern Red Cedar, Irish Juniper. The Douglas Spruce from Colorado needs further trial, but evidently lacks in hardiness. Some of these do better in sheltered portions on the southern edge of the state. Austrian Pine is not discarded but does not do as well as Scotch Pine in open exposure at Brookings.

What to Plant. The following have proven desirable for general planting: Jack Pine (from northwestern Minnesota), Scotch Pine, Black Hills or Bull Pine,† Blue or Silver Spruce from Colorado, Black Hills Spruce (the White Spruce of the Black Hills), the northern Red Cedar, the silvery form of the Red Cedar found in the Black Hills; of dwarf species the Savin or Creeping Juniper and Dwarf Mountain Pine (*Pinus pumilio*). *Abies concolor* or White Fir from Colorado is promising, but needs further trial. The Silver or Blue Spruce of Colorado (*Picea pungens*) is expensive, but is considered as one of the most beautiful of all known evergreens; the green-leaved form is much cheaper but not as ornamental. As a class, the spruces are more ornamental than pines, but of slower growth. For windbreaks, Jack Pine is especially desirable, as it is a fast grower and perfectly hardy; Scotch Pine is cheaper at present in the nurseries.

General Notes. Those familiar with evergreens realize that America, especially the Rocky Mountain region, possesses a magnificent lot of ornamental evergreens, but that these are scarce and high-priced in the nurseries, as compared with west European evergreens, the seed of which is cheap and easily imported. The general demand for cheap evergreens stimulate importation from the milder, moist sections of Europe, and our hardy drouth-resisting native species

†A. Norby, of Madison, S. D., writes: "Black Hills Pine is the prince of pines for the plains."

are neglected. As a class, evergreens are sensitive to change of elevation, soil and shelter conditions. The White Pine, for instance, which attains such magnificent proportions in the dense forests of Wisconsin and Minnesota, is worthless upon the open prairie; the Arborvitæ or White Cedar, a swamp tree from eastern Canada to central Minnesota, does not resist drought and even when well watered is sensitive to any trace of alkali in the soil.

Attempts are sometimes made to plant evergreens in the fall; this is a waste of time and money in this climate. The time usually regarded as best for transplanting evergreens is when the buds are swelling in the spring. Evergreens are easily transplanted if it is properly done, but an evergreen out of soil is like a fish out of water and can be killed in about as short a time. A few moments exposure of the roots to our drying sun and wind will dry the resinous sap so that any amount of soaking will be of no avail afterwards. The trees may look fresh and green for a time but will be dead in spite of their appearance. The mellow earth should be made very firm about the roots, care being taken that no caves or hollow places are left to dry out. In the nurseries, in transplanting large numbers of evergreens a tamper is used to firm the earth, larger than those used in setting fence posts, but precaution is always taken to have the earth loose on top to prevent baking. If the soil is wet, no tamping must be done as that would puddle it or cause it to bake very hard. Some water may be used when the hole is about half full, and care must be taken to leave the earth loose on top. In nursery planting on a large scale, water is rarely used, it being found best to plant when the soil is moist and tamp firmly.

In regard to mulching evergreens, it may be said that the best mulch is one of loose earth made by constant stirring of the soil all through the growing season. Many people make a mistake by mulching heavily and doing no cultivating. It must be remembered that the roots need air as well as mois-

ture and where frequent stirring of the soil is impracticable the mulch must be removed at intervals and the ground stirred thoroughly. If water becomes necessary, do not water every day as that is the best way to kill them, but water at intervals of a few days and then give the ground a good soaking.

In the fall a heavy soaking of the ground is especially desirable as the dry winter winds are trying on evergreens and all other plants. A point often made at our horticultural meetings is that the dry winter winds will take the moisture from a fence post. A very common mistake with evergreens is planting large trees. Trees from ten inches to two feet in height are more apt to live than those of larger size. Nursery grown trees, twice or more transplanted, are much better adapted to prairie culture than those direct from the forest which need careful shading the first year or two.

A BLACK LIST.

The following Shrubs and Trees winter-killed at this Station. No winter protection of any kind was given:

Botanical or Nursery Name.	Native Country.
Acer Negundo argenteo variegatum, Hort	United States.
Acer Nikoense, Max	Japan.
Acer Sieboldianum, Miq	Japan.
Andromeda speciosa, Michx	S. E. United States.
Aphananthe aspera, Planch	Japan.
Berberis Sinensis, Desf	S. Europe, Orient.
Carpinus laxiflora, Blme	Japan.
Castanea pumila, Mill	S. and E. United States.
Cercis Canadensis, Linn	S. and E. United States.
Cercocarpus parvifolius, Nutt	S. Rocky Mountains.
Corrus alba Spaethi, Wittmack	Garden Origin.
Corylus Avellana, Linn	Eu., N. Afr., W. Asia.
Crataegus mollis tiliifolia, Koch	S. and E. United States.
Cydonia vulgaris, Pers	Central and E. Asia.
Elæagnus longipes, Gray	Japan and China.
Euonymus obovatus, Nutt	Canada to Ind. and Ky.
Evonymus obovatus, Nutt	E. United States to Ky.
Fraxinus longicuspis, Sieb. & Zucc	Japan
Juglans intermedia Villmoriniana, Carr	A Hybrid.
Ligustrum Ibota, Sieb. & Zucc	Japan.
Ligustrum medium, Hort	Japan.

Botanical or Nursery Name	Native Country.
Lonicera coerulescens, Dipp	Turkestan (?)
Lonicera diversifolia	Himalayas, India.
Lonicera gracilipes, Miqu	Japan.
Lonicera Ledebouri, Eschsch	N. A.
Lonicera rupicola, Hook f. & Thoms	Thibet.
Magnolia stellata, Maxim	Japan.
Philadelphus cordatus, Hort	S. E. United States.
Philadelphus coronarius, Linn	S. E. Eu., Caucasus, Jap.
Philadelphus coronarius rosiflorus plenus, Hort	Garden Origin.
Philadelphus coronarius salicifolius, Hort	Garden Origin.
Philadelphus coronarius Satsumi, Sieb	Japan, Himalayas.
Philadelphus Godohokeri, Hort	S. E. United States.
Philadelphus Gordonianus Californicus, Hort	Cal. to B. Columbia.
Philadelphus gracilis, Hort	S. E. United States.
Philadelphus grandiflorus fl. pl., Hort	S. E. United States.
Philadelphus Keteleeri fl. pl., Hort	S. E. Eu., Caucasus, Jap.
Philadelphus latifolius, Schrad	Eastern United States.
Philadelphus laxus, Schrad	S. E United States.
Philadelphus Lewisi, Pursh	B. C. to California.
Philadelphus microphyllus, Gray	N. Mex. to California.
Philadelphus pendulifolius, Hort	Garden Origin.
Philadelphus Souvenir de Billard, Hort	Garden Origin.
Prunus Burgeriana, Miquel	Japan.
Prunus cerasifera atropurpurea, Dipp	Persia.
Prunus Pissardi, Hort	Persia.
Prunus cerasifera fol., purpureis, Spath	Persia.
Prunus Davidiana, Franch	Northern China.
Prunus domestica, Linn	Caucasus and Transcaucasus (?)
Prunus Mume, Sieb. & Zucc., Japanese Apricot,	Japan.
Prunus orthosepala, Koehne	Southern Texas.
Prunus pendula, Hort	Garden Origin.
Prunus Persica, Sieb. & Zucc	China.
Prunus Persica, from Mountains near Pekin	China
Prunus Persica, Vilmorin's	N. W. China.
Prunus spinosa, Linn	C. and S. Eng., N. Afr. and W. Asia.
Prunus triflora, Roxbg, Japanese plum	Japan, China.
Prunus triloba, Lindl	E. and Central China
Pyrus floribunda, Nichols, **P. floribunda,** Sieb.,	Japan.
Pyrus Kaido, Sieb	Japan.
Pyrus prunifolia pendula, Hort	China, Japan.
Pyrus Sinensis, Lindl., see note	China.
Pyrus Toringo atrosanguinea	Japan.
Rhododendron viscosum, Torr	S. and E. United States.
Rubus nutkanus, Moc	S. W. United States.
Rubus triphyllus, Thunb	Japan, Himalayas.
Salisburia adiantifolia, Salisb., **Gingko biloba,** Linn.)	Japan.

Botanical or Nursery Name.	Native Country.
Salix Caprea pendula, Hort	Garden Origin.
Spiraea bracteata, Zabel	E. Asia (?)
Spiraea albiflora, Zabel	Japan.
Spiraea Bumalda, Hort	A Hybrid.
Spiraea callosa macrophylla, Hort	Japan.
Spiraea Cantoniensis, Lour	China, Japan.
Spiraea coccinea, Hort	Garden Origin.
Spiraea fontenaysiensis alba, Hort	A Hybrid.
Spiraea fontenaysiensis rosea, Hort	A Hybrid.
Spiraea Foxii, K. Koch	A Hybrid.
Spiraea longigemmis, Maxim	N. China, Mongolia.
Spiraea pruinosa, Hort	Garden Origin.
Spiraea prunifolia flore pleno, Sieb. & Zucc.	China, Japan.
Spiraea Regeliana, Hort	A Hybrid.
Spiraea syringaeflora, Dieck	A Hybrid.
Tecoma radicans, Juss	S. E. United States.
Vaccinium corymbosum, Linn	E. N. A., to La.
Viburnum molle, Michx	New Eng., to Texas.
Viburnum tomentosa. Thunb	Japan.
Xanthoceras sorbifolia, Bge	China.

ADDITIONAL.

The above list may be extended by the following which are reported tender at Yankton by C. W. Gurney:

Aesculus Hippocastanum, Linn. Common Horse-chestnut.
Alnus glutinosa laciniata, Willd. Cut-leaved Alder.
Castanea Americana, Ref. Chestnut.
Hicoria ovata, Britt. (**Carya alba,** Nutt.) Shagbark Hickory.
Magnolia acuminata, Linn. Cucumber Tree.

NATIVE TREES AND SHRUBS.

Many of the native trees and shrubs of South Dakota are worthy of general cultivation, some, in fact, are more honored abroad than at home. Many native species have already been described in the foregoing pages. The following indicates some of the other ornamental species valuable for trial. For description and distribution see Bulletin 43 by T. A. Williams, and Bulletin 64 by D. A. Saunders: Common Juniper, Diamond Willow, Black Willow, Hop-hornbeam or Ironwood, Beaked Hazelnut, the Dwarf, Black and Canoe Birches, Burr Oak, Rock Elm, Creeping Barberry, Western Ninebark, Willow-leaved Meadow Sweet, Elder-leaved Mountain Ash, the Hawthorns, False Indigo, Fendler's Red

Root or Ceanothus, Red Root, Velvety Ceanothus, all the Dogwoods, Red-berried Elder, Wolf-berry, Indian Currant, and Hairy Honeysuckle.

In general, it may be stated that no beginner upon the prairies need wait until his means permit the purchase of cultivated shrubs and trees. In the nearest timber or creek bottom he may find enough wild plants to make a very satisfactory beginning in ornamenting the home grounds.

THE OUTDOOR FLOWER GARDEN.

The space available at this time will not permit a full discussion of prairie flower gardens. Probably no two lovers of flowers will agree as to the best varieties, hence the writer does not expect anyone to fully agree as to the following list:

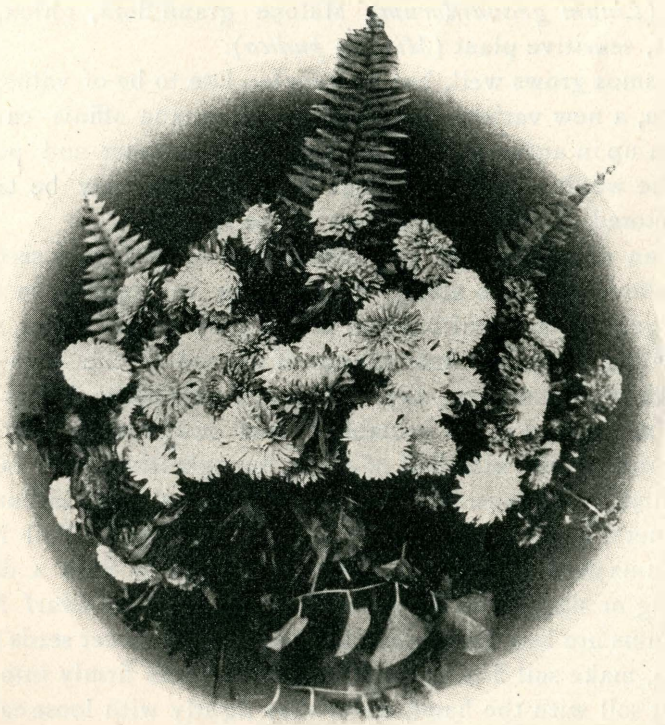

PLATE XXV—A CHOICE BOUQUET OF FLOWERS, CHIEFLY ASTERS, PICKED FROM A SOUTH DAKOTA GARDEN.

Annuals. For several years annual flowers have been cultivated at this Station with the view of determining what varieties will flourish with ordinary field cultivation, no transplanting and no watering; in fact, the same care that would usually be given to beans, beets, carrots and other garden vegetables. The following are the best of those that have done well under this field cultivation: Zinnias, sweet peas, tall nasturtiums, calliopsis, calendula, bachelor's buttons or Centaurea Cyanus, the French marigolds, California poppies or eschscholtzia, poppies, China asters, portulaccas, candytufts, sweet alyssum, single petunias, mignonette, pinks or dianthuses, four o'clock, Bartonia aurea, Nicotiana affinis, snow-on-the-mountain (*Euphorbia marginata*), annual chrysanthemum, *Helianthus cucumerifolius*, balsams, scarlet flax (*Linum grandiflorum*), Malope grandiflora, phlox, ice plant, sensitive plant (*Mimosa pudica*).

Cosmos grows well, but flowers too late to be of value; the Dawn, a new variety, does better. Nicotiana affinis can be taken up in autumn after blooming all summer and potted for the window garden. Four o'clock roots may be taken up, stored in cellar and set out in the spring.

If an abundance of cut flowers are desired, sow seed of the above varieties along with garden vegetables, so they will get the same cultivation; this is very much better than crowding them in a hole cut out of the sod on the lawn and sprinkling them every day. Of some, especially Asters and Phlox, the seed is too valuable to sow outdoors, so sow in a box and set out with ball of earth, transplanting once before the final transplanting. Verbenas, Pansies and Gaillardias do finely, but seed should be started in boxes. Tall Nasturtiums need no trellis but may be allowed to form a dense edging or single row if no trellis is handy; the dwarf Nasturtiums are less desirable. In sowing most flower seeds outdoors, make soil fine and mellow, press seeds firmly into the moist soil with the hand, cover very lightly with loose earth; in other words, have a firm seed bed and loose earth on top to prevent baking. Plant large seeds deeper.

Herbaceous Perennials. By this is meant plants whose roots live over from year to year indefinitely, and the tops die down to the ground every winter. Nearly 3,000 varieties are offered by American nurserymen and collectors of native plants.

The Peony (sometimes called the "King of flowers") is undoubtedly the best for general cultivation; plant as many of the herbaceous varieties as your purse and tastes dictate. (The Tree Peonies are shrubs and winter-kill in the northwest.)

The experience with perennials is limited in this state, but

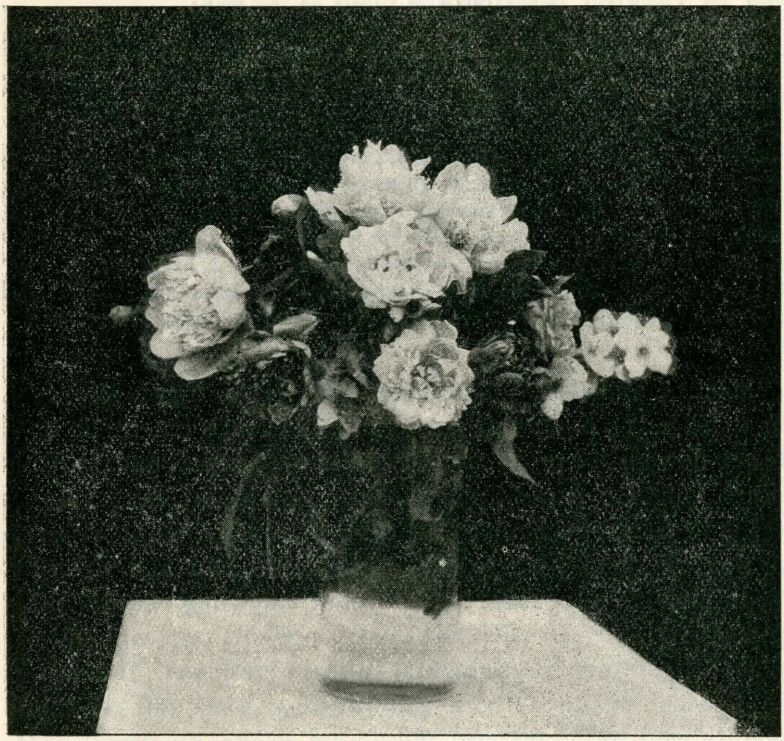

PLATE XXVI.

A bouquet of Peonies, gathered from the collection shown in Plate II. A small spray of Mock Orange at the right. Peonies are very hardy and desirable herbaceous perennials and are cultivated in more than one thousand named varieties.

the following are promising for general cultivation: Golden Glow (*Rudbeckia laciniata fl. pl.*), German Iris, Aquilegia, Phlox, Baby's Breath (*Gypsophila paniculata*), Delphinium, Gaillardia aristata, Tiger Lily, Papaver, Dicentra, Coreopsis. Hollyhocks need heavy winter mulching.

Native species. Penstemons or Beard-tongues, lilies, Sunflowers (especially Helianthus Maximiliani), Yucca and many others deserve a place in the garden. Bear-grass or Indian Soap-weed (*Yucca glauca*, Nutt.,) is "common in the dry soils, especially on bluffs from the Missouri valley to the Black Hills" (D. A. Saunders, in Bul. 64). Geo. H. Whiting, of Yankton, describes the plant as follows:

"*Yucca*—It is popularly known as Bear's Thread, or Adam's Needle, is an ornamental evergreen perennial plant, a hardy native having a cluster of lance linear sword-shaped leaves which are regularly serrated, and edged with slender threads which hang down some three or four inches. The flowers are produced during the months of June and July, and are borne on flower scapes or terminal panicles which attain a height of four or five feet. The individual flowers are numerous, cup-shaped, pendulous and of a cream color, and the plant remains in bloom for a considerable time. The inflorescence, is however, but a small part of its attractiveness, as its foliage is of the richest green during the autumn and winter months, when all other flowering and foliage plants have died away and left no trace of their summer beauty."

Most perennials need dividing and replanting every two or three years, otherwise the clumps become too thick and fewer flowers are produced. Peonies may be left undisturbed much longer. A good place for perennials and annual flowers is in front of a border of shrubbery, along a fence or drive, or next the house, where sod can be kept down and the soil kept mellow. In this border plant anything hardy that pleases you. Even pieplant and asparagus are not out of place; the former is ornamental in leaf and flower, the latter in leaf and fruit. Give a top-dressing every fall of thoroughly well-rotted manure and do not spade up deeply. If next to the sod, the grass roots can be kept from doing much damage by a wide board sunk edgewise into the soil even with the surface.

Hardy Bulbs. The many varieties of Tulips, single and double, early and late, are especially desirable. Plant in autumn and mulch with stable litter over winter. By planting alternate rows of single and late varieties, the season of bloom may be prolonged. When the foliage dies down, plants of Asters or other flowers may be set in between, or seed of Zinnia or Petunia sown earlier between the rows; this gives a second floral display later in the season.

Varieties for General Cultivation.

DECIDUOUS TREES AND SHRUBS.

The figures refer to the pages giving description. For small collections choose the first few on each list for a beginning.

LAWN TREES.

Cut-leaved Weeping Birch, 110; Hackberry, 115; Box Elder, 105; White Elm, 189; Green Ash, Red Ash, 124; Russian Oleaster, 117; European White Birch, 110; Wild Black Cherry, 168; Burr Oak, 197; Rock Elm, 197; American Aspen, 161; Bolle's Poplar, 159; Pin Cherry, 167; Mountain Ashes, 180-181; Choke Cherry, 169; Wild Plum, 162. See also under Poplars, 141-161 and Willows, 177-179.

CHOICE HARDY SHRUBS.

Spiræa Van Houttei, 185; Spiræa, Arguta, 181; Tartarian Bush Honeysuckles, 133-134; Golden Currant, 174; Siberian Pea tree, 111; Caragana microphylla, 113; Roses, 175-177; Lilacs, 186-187, Snowball, 190; Juneberry, 106; Siberian Dogwood, 116; Western Sand Cherry, 163, Siberian Almond, 166; Mock Oranges, 137; Hydrangea, p. g., 124; Cotoneaster acutifolia, 116; Purple-leaved Barberry, 110; Silver Berry, 123; Burning Bush, 123; Tamarix Amurensis, 188; other Honeysuckles, 129-134; other Spireas, 181-185; High Bush Cranberry, 190; Snowberry, 185; dwarf Maples, 105-106; Prunus tomentosa, 168; Buffaloberry, 179; Viburnum Lentago, 189; Siberian Sand Thorn, 126; Black Currant, 174; Elderberry, 179.

SHRUBS OF TRAILING HABIT.

Box Thorns, 135; Lonicera Alberti, 129.

VARIETIES WITH ORNAMENTAL BERRIES.

Burning Bush, 123; Honeysuckles, 129-134; Box Thorns, 135; Mountain Ashes, 180-181; Waxwork, 115; Cotoneaster acutifolia, 116; Berberis, 108-110.

VARIETIES WITH BRIGHT COLORED BARK.

Red, Siberian Dogwood, 116; *yellow*, Salix, 178-179.

VARIETIES WITH BRIGHT COLORED LEAVES.

Purple, Barberry, 110; Birch, 111; *yellow*, Spiræa, 184.

CLIMBING VINES.

Virginia Creeper, 107; Waxwork, 115; Trumpet Honeysuckle, 133; Woodbine, 132; Dakota Wild Grape, 191; native Clematis, 115.

HEDGES.

For ornamental, low, thorny hedges, Caragana Arborescens, 111; Buckthorn, 173, Buffaloberry, 179; Siberian Sand Thorn, 179. Very low, thorny, Berberis Thunberg, 109.

For low ornamental hedges and screens, not thorny, Bush Honeysuckles, 133–134; Golden Currant, 174.

For very low ornamental hedges, Snowberry, 185; Spiræa Van Houttei, 185.

For low temporary screens, Artemenia, 108.

For large, thorny, stock-proof hedges, Russian Oleaster, 117.

For tall-growing windbreaks, White Willow, 177; Russian Golden Willow, 178; Poplars, 141-161.

For smaller-growing windbreaks, Russian Oleaster, Box Elder, 105; Wild Plums, 162.

ACKNOWLEDGMENTS.

From nurserymen and florists, valuable reports of experience have been received from E. D. Cowles, Vermillion; C. W. Gurney, Yankton; D. F. Harrington, Sioux Falls; H. W. Hinds, Parker; E. C. Newbury, Mitchell; A. Norby, Madison; C. Thompson, Rapid City; Geo. H. Whiting, Yankton. Valuable reports have also been received from John H. Miller, Huron; H. D. Walrath, Watertown; H. C. Warner, Forestburg, and many others interested in horticulture throughout the state.

The photographs are all from the grounds of this Station except the following: Plates 18 and 19 are views taken on the lawn of Horace Fishback, Brookings; Plate 20 on President Heston's lawn, Brookings; Plate 12 on John H. Miller's lawn, Huron; Plates 7, 8, 9 and frontispiece are from views taken in Russia; Plate 6 in Germany.

Of the twenty-seven photographs shown in this Bulletin, Plates Nos. 5, 10, 18, 19, 20, 21, 23, 25, 26, were taken by A. B. Holm, of this Station; Nos. 1, 2, 4, 13, 14, 15, 16, 22, 24 by O. G. Oyloe, of Brookings; Nos. 3 and 11 by W. S. Thornber of this Station; No. 12 by E. J. Miller, of Huron; Nos. 6, 7, 8, 9 and the frontispiece by the writer.

ERRATA.

Page 105, line 35, for variegatium read variegatum.
Page 112, line 7, for Assinaboia read Assiniboia.
Page 116, line 27, insert Siberia after "Baikal."
Page 123, line 21, for Elaegnus read Elæagnus.
Page 124, line 16, for lancolata read lanceolata.
Page 127, line 21, for decidna read decidua.
Page 129, line 3, for Spinosa read spinosa.
Page 129, line 32, for rosa read rosea.
Page 134, line 33, for virgindalis read virginalis.
Page 141, line 16, for Arpens read Aspens.
Page 171, line 5, omit comma after floribunda.
Page 176, line 2, for lueta read lutea.

IN CONCLUSION.

Seven Sylvan Suggestions.

A careful study of the native habitat of the over five hundred plants mentioned in this Bulletin will repay the lover of plants. The following deductions may fairly be made:

1. Faulty methods of propagation, especially the use of tender or uncongenial stocks, sometimes give hardy plants a bad name. The foregoing list of trees and shrubs, would have been larger, notably in Prunus and Pyrus, but for the winter-killing of the tender roots or stocks, making definite judgment unsafe.

2. As a rule, plants from Japan, most of China, the southern and central parts of Asia and Europe, and the milder coast regions of the United States, are not hardy in South Dakota. In other words, plants from a comparatively mild, moist coast climate are not adapted to a dry continental climate. Man readily adapts himself to such environments and finds the climate salubrious, but plants have no power to provide against such extreme changes.

3. Plants from the drier, interior northern parts of Europe and Asia prove hardy in South Dakota. This suggests the thought that tree planters in the hearts of the three continents in the northern hemisphere, North America, Europe and Asia, might with mutual advantage exchange all the treasures of their flora for trial.

4. Many plants can not adapt themselves to a change in location nor to cultivation in open exposure. Some hardy, native plants, which flourish in sheltered places or

on moist land, fail on dry upland. Some plants are strong and aggressive, while others are retiring and dependent.

5. Trees and shrubs extending over a wide geographical range vary greatly in hardiness according to their locality. Hence great care should be taken in the selection of seeds and plants. This variation in hardiness points to a slow process of acclimation by nature. De Candolle writes in "The Origin of Cultivated Plants:" "The northern limits of wild species * * * * have not changed within historic times although the seeds are carried frequently and continually to the north of each limit. Periods of more than four or five thousand years, or changements of form and duration, are needed apparently to produce a modification in a plant which will allow it to support a greater degree of cold."

6. We should take full advantage of this great work done for us by nature in acclimating plants, and cultivate our local form of the native species instead of the form adapted in the course of thousands of years to a mild, moist climate.

7. This fundamental thought, to work with, and not against, nature in the adapting of plants to our prairie climate, underlies all efforts in the improvement of plants, both fruit and ornamental, which is the main line of work of this department.

INDEX TO COMMON NAMES.

Deciduous Trees and Shrubs.